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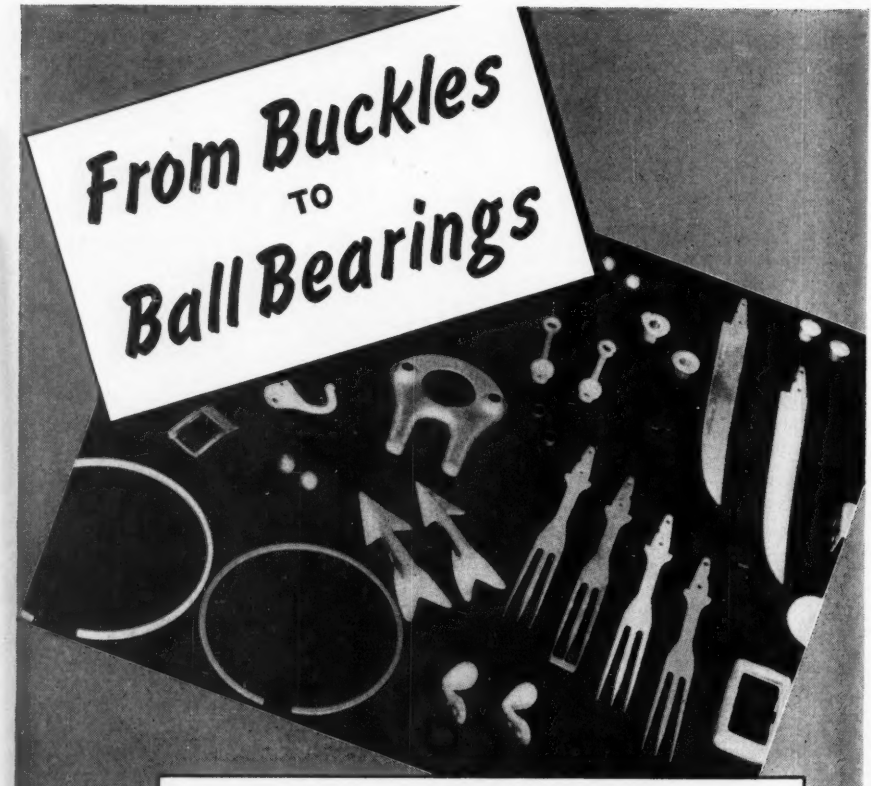

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EZRA A. BLOUNT, *Editor*

Products finishing

JANUARY 1951
VOLUME 15 • NUMBER 4

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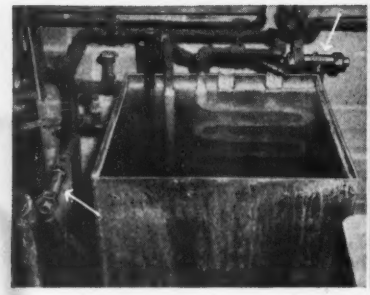

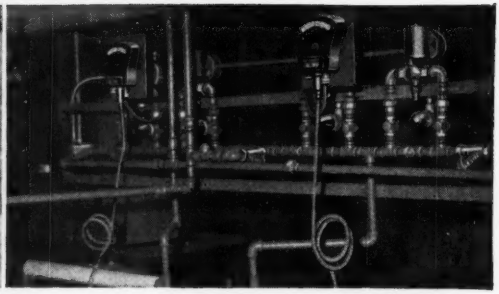

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PF editorial

Vol. 15, No. 4
JANUARY, 1951

Finishing in 1951

Over the past several years there have developed certain trends in the finishing industry which may serve as guideposts pointing the direction to be taken by the industry during 1951, subject to the demands of the Armed Services and government regulations.

One well established trend is toward the application of zinc and aluminum die castings to the manufacture of an increasing number of products. Die castings can be manufactured quickly, economically, and can be finished inexpensively, either by electroplating or by the application of organic finishes. In the manufacture and finishing of die castings, which will be limited by the zinc and aluminum available, increasing use will be made of clear or colored surface conversion coatings, either as final treatments or prior to the application of lacquer or synthetic enamel.

The continuing shift to mechanical finishing methods will be accelerated by the shrinking manpower pool, and such installations will be made as long as equipment suppliers can fill orders. Mechanical finishing may be performed either on automatic buffing and polishing machines, or in tumbling barrels employing various kinds of tumbling media. This is particularly true in the case of die castings which are now being prepared for plating mechanically by automatic polishing and buffing, or by one of four different barrel tumbling or finishing processes.

The employment of black finishes either as surface treatments prior to painting or as final coatings on military equipment will be expanded. Certain oils, clear lacquers, or synthetic finishes may be used as final coatings as the situation demands.

In the organic coating field more installations for spraying lacquer and synthetic enamel by the Hot Spray Process will be made. Further, the employment of steam rather than compressed air to atomize and spray paint finishes will attract increasing attention from paint users. The work which has been done to develop special corrosion-resistant aircraft primers will be continued. New methods of finishing aircraft to provide smooth surfaces, particularly on those planes designed to fly at near-sonic speed, will be devised.

Shortages in the entire finishing field may be expected both with regard to critical metals, such as nickel, cadmium, zinc, cobalt, chromium, copper, and also with respect to certain resins and other products used in the organic coatings industry. Alternate methods of solving finishing problems will be devised. One of these, the substitution of a tin/zinc alloy for cadmium in rustproofing applications is reported in an article beginning on Page 22 of this issue. Dr. William Blum of the National Bureau of Standards has outlined certain changes to be expected in the electroplating industry, and some of his suggestions as to the action to be taken by the industry are reported on Pages 78 and 80 of this issue.

During too many of the years over which the memory of those currently active in the finishing industry extends, it has been necessary for the electroplater or organic finisher to be extremely versatile to survive. During 1951 the finisher will have to be more adaptable and more versatile than ever.

Ezra A. Blount

Pf FEATURE

The manufacture of mild steel copper-hydrogen - brazed evaporators is only one of the specialties of the Heintz Manufacturing Company. Other products supplied by this alert organization include porcelain enamel washer tubs, various deep-drawn specialty items such as gasoline pumps, complete kitchen cabinets, stainless steel beer barrels, automobile fenders and one-piece steel automobile tops.

Refrigerator evaporators consist of an inner and outer steel shell, brazed together. In the stamping and forming operation, the "coils" are pressed into the steel blanks and, to assist in securing perfect alignment of the shells, a slight flange is formed on the outer section. The two sections of the evaporator must match perfectly so that the refrigerant will flow through the "coils" thus formed without being obstructed.

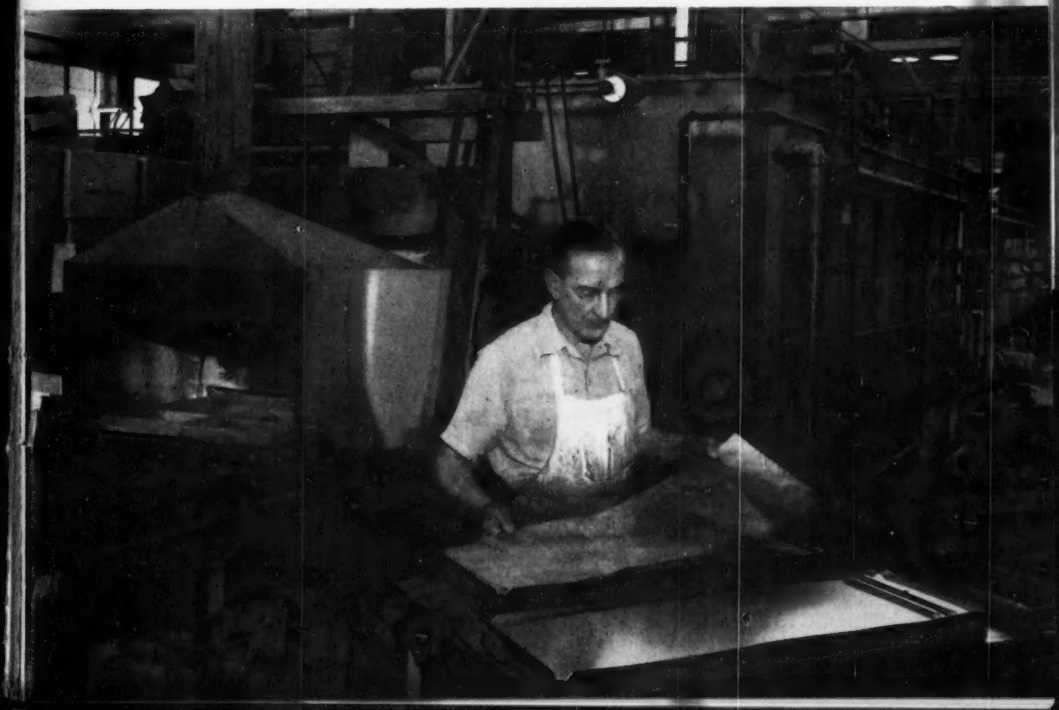
The formed evaporator sections are conveyed to an Industrial spray washer for cleaning. This constitutes the first step in the assembly and finishing process in the Evaporator Division proper. The steel parts are conveyed through the washing machine on a woven steel belt, and drawing compound as well as other foreign matter is removed from the steel by an alkaline cleaning solution sprayed on the

Fabricating and Finishing Setup for Refrigerator Evaporators

Steel refrigerator evaporators are hot dip galvanized, phosphatized, and sprayed with an aluminum baking lacquer in the Evaporator Division of the Heintz Manufacturing Company, Philadelphia. In this interesting combination of inorganic and organic finishing, evaporators—key items in each refrigerator—are produced economically yet under rigid quality standards on a mass production basis.

By EZRA A. BLOUNT
Editor

Fig. 1—Controlled atmosphere brazing furnace. Operator is shown inserting electrolytic copper foil between evaporator shell sections in preparation for the brazing operation.



parts in the washing machine. Following the alkaline spray, the parts are thoroughly rinsed with hot water, after which they pass through a hot air drying section of the washing machine and emerge clean and dry, ready for fabrication and finishing.

Indicative of the careful process planning for this manufacturing operation is the fact that the unloading end of the washing machine is located adjacent to the loading station for the hydrogen brazing furnace. This obviates the necessity for extra handling of the evaporator shells as well as any requirement for banking space, transporting facilities, and so on.

Formed, cleaned inner and outer shell sections are loaded on brazing plates separated by a sheet of thin electrolytic copper foil (see Fig. 1) and fed through a hydrogen brazing furnace controlled as to furnace atmosphere and temperature. (The brazing furnace may be seen in the background of Fig. 1.) The brazing operation is carried out at approximately 2000 deg. F., after which the brazed shells are conducted through a series of cooling chambers (100 feet in length), which are water jacketed and regulated as to temperature by sections, so controlled that the brazed evaporator sheet is delivered at the unloading end of the furnace at a temperature of about 100 deg. Fahrenheit.

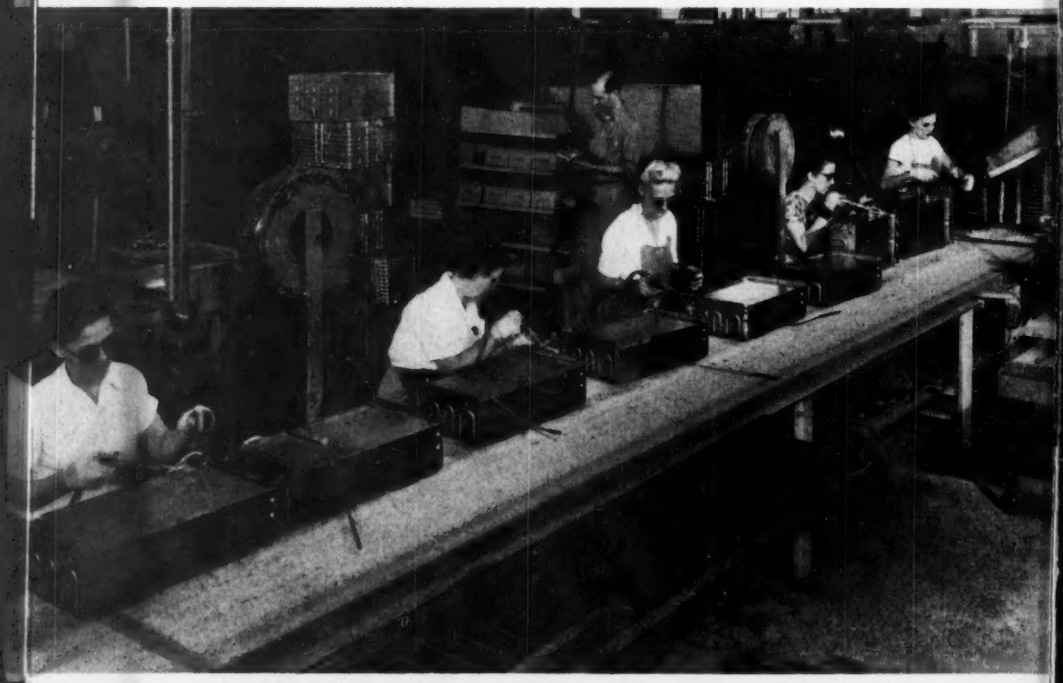


Fig. 2—Steel tubes to complete the refrigerating circuit on the evaporator units are silver soldered in place on a belt conveyor which transports the evaporators to a testing tank.

The brazed evaporator shell is next trimmed in a press located near the

unloading end of the brazing furnace. The flange formed on the outer shell serves as a gage for the first trimming operation.

After trimming, the burred edges of the evaporator shells are rolled or "edge formed" by being processed through a machine specially designed for the purpose by the Heintz Company. The resulting smooth, rounded

ing holes for mounting brackets and shelves, after which any burrs formed as a result of the piercing operation are carefully coined.

The operation of bending the evaporator shells to form the familiar open-end box shape is indeed a critical operation since it must be performed without flattening the refrigerant coils which are pressed into the outer shell

Fig. 3—A view of the cleaning and pickling room in which quick freeze and freezer storage evaporators are prepared for the galvanizing operation.

edge eliminates the possibility of roughness, lumps, or uneven zinc coating after the galvanizing operation. Since evaporators are fed flat between vertically mounted rolls for this roll forming operation, two machines, one for each width of the evaporator, are utilized.

The next operation is that of piercsection. This operation is called "U-ing up" at Heintz and is performed on an air-operated tangent bender. After the evaporators have been bent into this "U" shape, the flat steel evaporator top is riveted in, completing the basic unit.

Steel tubes to connect the ends of the formed coils are now inserted and

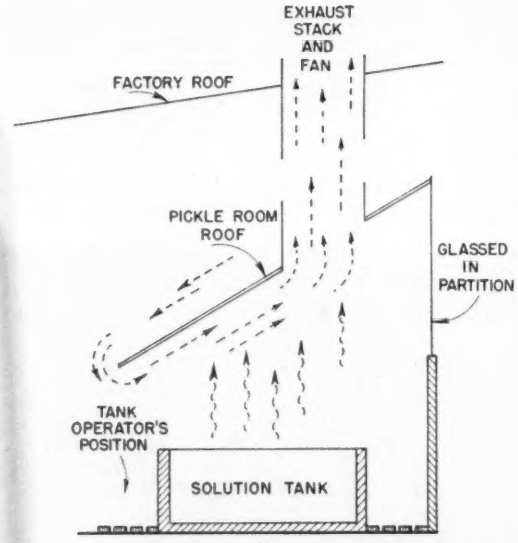


Fig. 4—A sketch (not to scale) showing a cross-section view of the cleaning and pickling room illustrated in Fig. 3. The sketch points out how steam and small quantities of fumes from the processing solutions are removed easily by a current of air moving slowly down the pickle room sub-roof and rising along the inner surface of the same roof into the exhaust stack. The installation is so designed that the tank operator who transfers evaporators from one tank to another by means of an air-operated overhead tramrail conveyor is not subjected to a strong draft; yet objectionable fumes are carried away from him and up the stack in a most efficient fashion.

silver soldered in place on a belt conveyor, as shown in Fig. 2. This operation is called "building the circuit." The silver soldering is performed at approximately 1400 deg. F. with a specially designed divided torch.

A "blow through" test and a final pressure test at 300 p.s.i. air pressure under water checks the soundness of the refrigerant circuit thus formed. Evaporators are now ready for the cleaning and pickling which precedes the galvanizing operation, and are transported to the well-ventilated pickling room (see Figs. 3 and 4) where they are loaded on special racks attached to cross bars for processing through the cleaning and pickling cycle. An overhead tramrail conveyor fitted with an air-operated hoist carries the loaded cross bars through the various solution tanks containing the cleaning, rinsing, pickling, and fluxing solutions.

The evaporators, now ready for galvanizing, are unracked and transported to the galvanizing area which is located adjacent to the pickling room, but separated from the pickling room by a glassed-in partition.

Evaporators are galvanized in one of three gas-fired zinc kettles, each containing 17 tons of zinc. The evaporators are mounted two per galvanizing fixture, which is attached to a hoist and immersed slowly in the molten zinc (held at a temperature of 850 deg. F.), through a flux blanket composed of sal ammoniac and commercial glycerine which covers one-half of the molten zinc surface. After the evaporator has been fully immersed in the zinc, it is moved through a gate, which controls the area covered by the flux, over to the portion of the galvanizing kettle which has a perfectly clear surface, and withdrawn completely covered with a coating of zinc.

After the evaporator is removed from the galvanizing kettle (as shown in the article heading), it is dusted with granular sal ammoniac so that the zinc on the surface has a tendency to flow, and thus not form the familiar crystals or "spangles" commonly identified with galvanized objects. "Tears" or excess zinc drops are removed from holes and edges with a gas torch set for a low flame temperature.

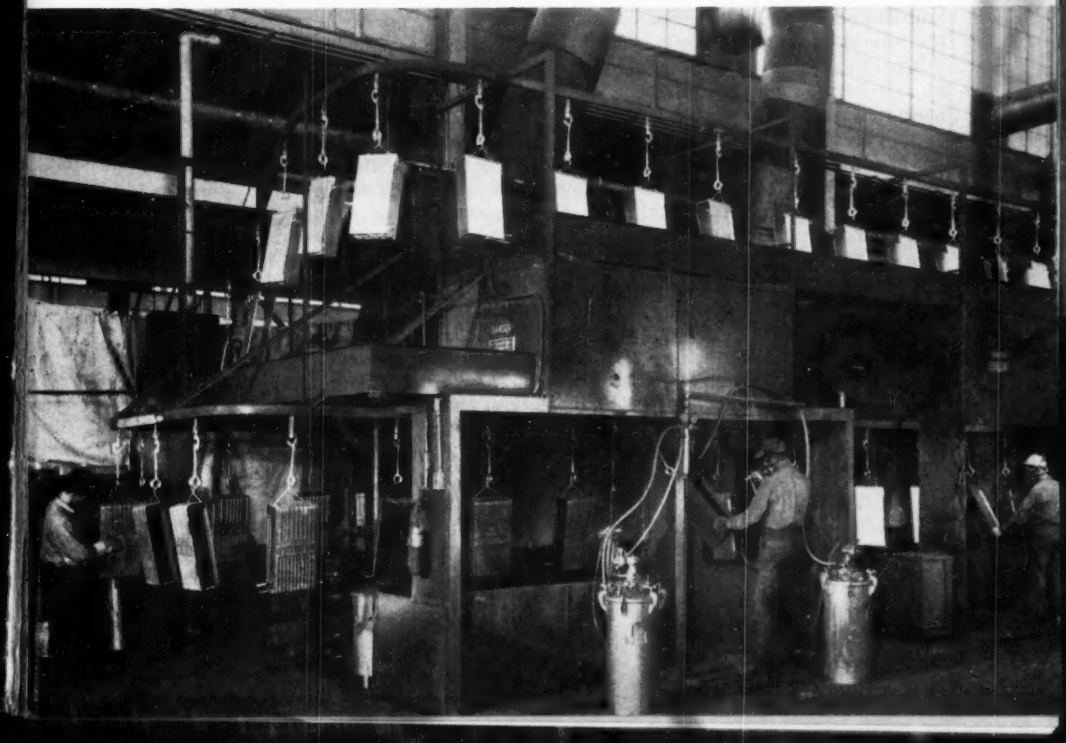
In the galvanizing operation very pure zinc is used, and galvanizing kettles are drossed mechanically every other week. This ensures a high quality zinc coating on every evaporator.

Galvanized evaporators are cooled on trucks which transport them a very short distance to an inspection line through which they are processed as the next step in the manufacturing operation. Minor surface roughness which may be present is removed, any necessary straightening of the evaporator is accomplished, and each evaporator is pressure tested under water at 300 p.s.i. to be sure that no leaks have developed in the galvanizing operation. Evaporators are conveyed on a roller conveyor from the inspection station to the loading area for the phosphatizing process. Twelve evaporators are loaded on each rack and conveyed through the various solution tanks by a cross rod tramrail overhead conveyor similar to that used in the cleaning and pickling operation previously described. An air-operated hoist is used with the tramrail conveyor to make possible rapid dipping and removal.

Phosphatized evaporators are hung on racks and prebaked in a batch type oven for a relatively short period of time. After the oven is loaded, evaporators are kept in the oven until the temperature has been brought up to 325 deg. Fahrenheit.

Prebaked evaporators are hung on a continuous chain transport conveyor, carefully cleaned with tack rags, and sprayed with an aluminum pigmented methacrylate finish in water-washed spray booths fitted with extension wings, as shown in Fig. 5. The conveyor is so constructed that evaporators are permitted to air dry one-half hour

Fig. 5—This view of the paint spraying section of the evaporator department shows the well-planned conveyor arrangement for transporting evaporators through this part of the process.



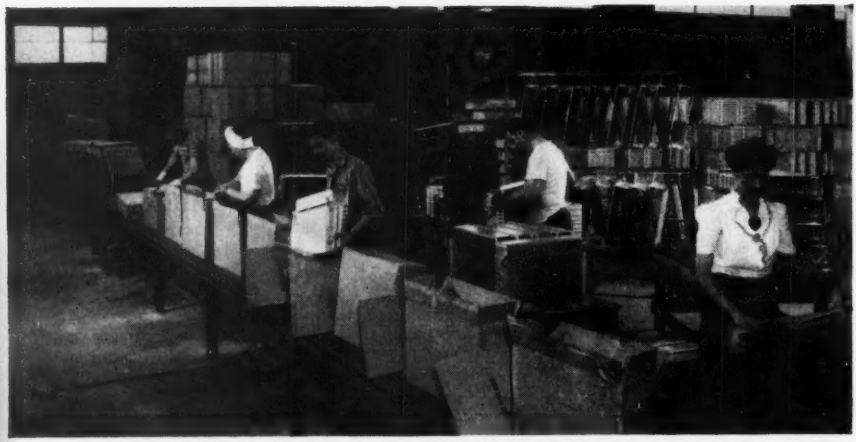


Fig. 6—Completed evaporators are packed on a belt conveyor and loaded directly into railroad freight cars for shipment.
(All photos courtesy Heintz Manufacturing Co., Philadelphia, Pa.)

at room temperature, and still on the conveyor, are transported through another spray booth where a mist coat of clear methacrylate lacquer is applied. The sprayed evaporators are now removed from the overhead conveyor and loaded on racks for final baking in the box oven.

The baking operation is conducted at 300 deg. F. for 26 minutes. Baked evaporators are removed from the oven, cooled on the oven racks, as can be seen in Fig. 6, wrapped in wax paper, packed in cartons, and loaded directly into freight cars which are located on a siding completely along one side of the plant proper.

The finish on the evaporator must withstand humidity and abrasion tests and must match in appearance the color of the aluminum ice cube trays which will be used with the evaporator when it is finally installed in a refrigerator. Evaporators manufactured by this method not only fulfill requirements concerning the beauty and utility of the finish, but also exhibit excellent heat transfer characteristics so that service complaints for any cause are indeed rare.

Suggestions for Saving Nickel

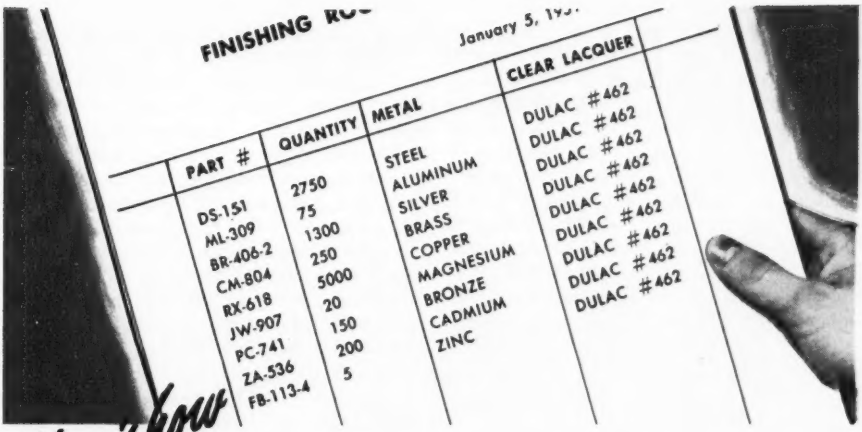
THE current nickel shortage has necessitated a review of possible ways to conserve this precious commodity, and these suggestions are offered:

1. The largest saving of nickel can be made by copper plating to a thickness of 0.0006 inch or more, depending on the shape of the work and the plating specificatons. The work is then copper buffed. A lime composition containing a rather high amount of grease gives less cut-through work than any other composition. The amount of nickel deposited over the copper will depend on the job being plated.

2. Filter press lines must be carefully checked for leaks. That packing on the filter pump will require watching. Be sure to get all the solution out of the press.

3. Proper design of plating racks will save a surprising amount of metal. Check it closely yourself or call in your rackmaker.

4. Save-rinse tanks will save a sub-



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stantial amount of nickel. For instance, with an 1,100 gallon bright nickel bath containing nine ounces of metal per gallon and using a 170 gallon save-rinse tank, at the end of eight hours the solution in the save-rinse tank analyzed ⅛ ounce of metal per gallon. In addition, there is a large saving in other bath constituents such as brighteners. Two save-rinse tanks are also needed for barrel nickel plating lines. Of course, the barrels must be rotated while in the air.—*Clyde Kelly; "National Plating News", August 1950.*

Sources of Information on Solvents

SINCE improper handling of solvents may result in fire and subsequent property damage, or illness contracted by workers using solvents, it is important to be well informed about the liquids in use in the plant or shop. Information on the properties of the solvents employed and the safety of solvent-using processes may be obtained from a number of sources.

Chemical manufacturers are interested in preventing solvent accidents and are, therefore, a major source of information on the properties and correct handling procedures for the chemicals they produce. In many cases, the solvent distributor can supply the information, or can contact the manufacturer concerned.

The Manufacturing Chemists' Association, to which solvent manufacturers belong, publishes detailed Safety Data Sheets on a great many products, and they may be purchased from its Washington, D. C. office. The National Safety Council, which has its headquarters in Chicago, is another organization which publishes data sheets on the safe use of various solvents. The National Fire Protection Association, in Boston, Massachusetts, publishes standards on handling flammable solvents.

There are also various governmental industrial hygiene agencies which can supply information on solvents and solvent processes. In addition, these agencies can supply various services, such as a check of the solvent process, a survey of ventilating equipment, examination of employees for symptoms of illness resulting from excessive exposure to solvents or solvent vapors, and assistance in planning a safety program.

Literature and data on health aspects may be obtained from the Industrial Hygiene Division of the U. S. Public Health Service, which has it headquarters in Washington and also has district offices throughout the country.

State agencies also publish literature and render the services described through State Bureaus of Industrial Hygiene. These are located in the

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State Department of Health, except in Massachusetts and New York, where they are part of the Labor Department. A number of cities have municipal hygiene departments which can render assistance.—*Safety Research Institute, Inc.*

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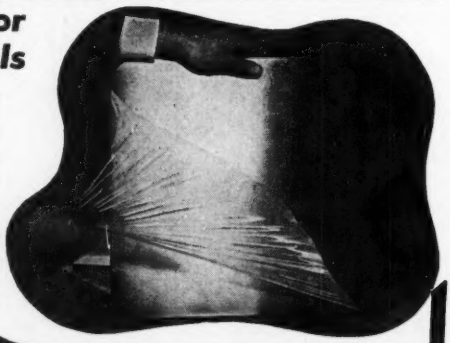

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Some Practical Notes on Tin/Zinc Alloy Plating for Ferrous Components

EXPERIENCE in plating shops has shown that the electrodeposition of alloy coatings on metal components is generally a difficult proposition when sound deposits of reasonable uniformity are required. This is particularly the case when limits are imposed upon the alloy composition, even when such limits are reasonably wide. Problems arise with respect to the relative compositions of the anodes employed, the electrolyte used, and the metal deposited, as well as in the maintenance of the electrolyte composition. Generally much fundamental work has preceded the introduction of the process in order to solve the numerous troubles encountered. Tin/zinc alloy plating, while not being free from intricacies and peculiarities, is an exception insofar as a workshop schedule of operating has been devised as a natural corollary of the fundamental research and development of the process by the Tin Research Institute.

Zinc will be recognized as the metal normally employed for providing an electroplate coating on iron and steel for protection against corrosion. It is anodic to these metals and its role in preservation is a sacrificial one insofar as it itself corrodes. Even under moderately damp conditions, the coating whitens due to the formation of zinc corrosion compounds, a phenomenon known as "white rusting." The rate of deterioration can be reduced by suitable passivation processes or by lacquering.

Tin is a much less active metal than zinc and it exhibits markedly superior corrosion resisting properties. However, it is cathodic to iron and steel, and, if it is selected as a protective covering for these metals, the coating needs to be continuous and free from porosity; otherwise rusting can occur through these discontinuities. In specialized applications the tin coating may also be passivated by a film-forming process to give added durability.

Tin/zinc alloy coatings can be produced over a range of compositions from high to low tin contents, and the properties of the deposits vary accordingly. The high-tin alloys are closer to pure tin in their performance, while the high-zinc alloys are nearer to pure zinc in serviceability. Tin/zinc alloy coatings should have a composition in which the zinc ingredient is sufficient to render the coating sufficiently anodic to the base metal to assist in safeguarding against rusting under corroding conditions at pores and minor discontinuities, and in which the tin content is high enough for the general appearance of the coating to be maintained under conditions of dampness, and for the tin to impart its natural qualities such as easy solderability. Deterioration of the finish is further safeguarded by a filming process achieved by the simple procedure of immersion in 5 per cent chromic

Of timely interest, in view of the current shortage of cadmium and nickel, is this article, prepared by a leading British technologist, which describes the application and characteristics of a tin/zinc alloy plate for protection against corrosion.

—The Editors

acid solution for 5 to 15 seconds at temperatures up to 140 deg. F. depending upon the composition of the alloy coating.

The electrolyte used for the alloy plating is a combination of the cyanide zinc and sodium stannate tin solutions, known throughout the electroplating industry. The chemicals required include sodium cyanide, zinc cyanide, sodium stannate and caustic soda, no other addition agents being necessary. The electrolyte can thus be operated in a welded mild steel or iron tank, as used for the normal alkaline processes for zinc, tin or cadmium plating. Wire reinforced glass linings to obviate short-circuiting between anodes and the tank are desirable.

Alloy anodes are used; for example, for depositing the 80/20 tin/zinc alloy, cast anodes containing 80 per cent tin and 20 per cent zinc are employed. They are "filmed" in a manner similar to the procedure adopted for the tin anodes used in the alkaline stannate process. This ensures that tin dissolves as stannate. To produce the film, the anodes are lowered slowly into the bath with the current switched on, or are polarized at higher voltage for a few seconds.

The process is operated at 150 to 160 deg. F. using a cathode current density of the order of 15 to 20 amp. per sq. ft. and an anode current density of half this magnitude. The electrolyte has to be maintained by chemical analysis. Periodic checks are required for caustic soda and for sodium cyanide, the former because this largely determines the composition of the alloy deposited, and the latter because of its gradual decomposition at the temperature of operation. Tin and zinc are also determined; but, once the working conditions are properly established, less frequently than the hydroxide and cyanide.

The usual methods of determining deposit thickness are applicable; weighing before and after stripping for average thickness, and microsectioning for local thickness. Drop, jet or magnetic gage tests can also be adapted. The throwing power of the electrolytes is good but it will be found that the throw of tin is superior to that of zinc, and therefore the deposit will be richer in zinc near edges and at prominences, and richer in tin in recesses, although the average composition may be arranged to satisfy a predetermined value fairly closely.

The electrolytes quoted by the Tin Research Institute ("Tin and Its Uses," No. 17, October 1946) are as follows:

ALLOY COATING		
	80/20 Tin/Zinc	50/50 Tin/Zinc
Tin content of electrolyte	30 g./l.	30 g./l.
Zinc content of electrolyte	2.5 g./l.	8 g./l.
Free sodium hydroxide	4 to 6 g./l.	6 to 8 g./l.
Sodium cyanide content	25 g./l.	50 g./l.

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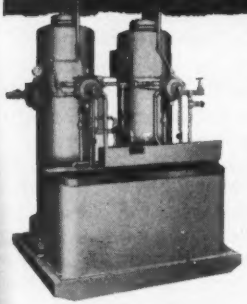

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These alloy coatings are of particular interest to the electrical industry because, apart from good coverage and corrosion resistant properties, they are solderable using non-corrosive rosin fluxes. Surprisingly, the zinc ingredient does not prevent good soldered connections (without troublesome "dry joints") from being achieved. Actually, the zinc tends to float to the surface of the junction without interfering with the quality of the connection. At one time, cadmium was the preferred plating for iron and steel in the electronics industry. The reasons for this are ease of deposition, excellent throwing power, good protective qualities, neat appearance, and, above all, ease of soldering with rosin as flux. Cadmium has been difficult to obtain and very expensive for the last ten years, and is becoming almost unobtainable for plating purposes. Tin/zinc alloy is the only plating that can approach these requirements. In fact, so closely does it satisfy them all, that it should be regarded as an alternative rather than a substitute. It also has one advantage; it can be spot-welded under conditions obtaining in the radio industry more readily than zinc or tin and much more readily than cadmium. Many steel radio chasses and other components are of spot-welded construction, and it is always preferred that welding should be carried out after plating so as to avoid the risk of chemicals being trapped in the overlapping junctions. The tin/zinc alloys permit this operation.

The components of electrical apparatus are invariably intricate in shape, and they have to be handled through commercial plating plants in large quantity. Methods of jigging or racking can be devised to ensure the best possible coverage of the article, but projecting edges receive a comparatively heavy deposit while the extremities of recesses may get very little.

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Design of article must obviously take care of this aspect as far as practicable. In practice today, the minimum local thickness of plating is judged to be the discerning factor as far as serviceability is concerned. The British standard of interpretation of measurement of local thickness restricts the selection of points of test to those not closer to edges than ¼ inch, and such that they can be touched with a sphere of 1 inch in diameter. In this way the uncontrollable extreme areas are excluded from test. The minimum local thickness of 80/20 tin/zinc alloy plating advocated for the protection of electrical apparatus for varying degrees of severity of service is suggested below against comparative data for zinc and cadmium:

EXPOSURE CONDITIONS	Mild	Normal	Severe
Tin/Zinc Alloy (80/20)	0.3 mil	0.3 mil	0.5 mil
Zinc	0.2	0.3	1.0
Cadmium	0.2	0.3	0.4

It is considered that the tin/zinc alloy should be filmed, that it is advantageous to chromate passivate the cadmium, and that it is essential to chromate passivate the zinc coating.

It will be seen that for normal usage, equal thicknesses of the three finishes are advocated whereas in the two extremes slightly thicker tin/zinc is suggested, and for the severe extreme, much heavier zinc is necessary. The extra thickness of tin/zinc takes care of the poorer throw of the zinc constituent into the inner bends; the extra thickness of zinc is necessary to offset its greater rate of deterioration under severe conditions.

Regarding performance under corroding conditions, some test results from exposure under accelerated conditions are presented in Tables, I, II, and III.

Table I deals with behavior under a standard salt spray test, the latter consisting of exposure in the mist from 20 per cent salt solution atomized with compressed air at room temperature. The atomizer is operated during the eight-hour working day, and the specimens are left in the mist laden cabinet for the remainder of the 24 hours. Specimens are rinsed in running water and dried with a cloth for examination at the end of each cycle.

The minimum local thicknesses of the platings specified ranged from 0.50 to 0.70 mil. The performance under salt conditions is deemed to be exceptionally good, with the 80/20 alloy a little superior to the 50/50 composition on account of the lesser intensity of whitening. Plain zinc plating under similar conditions, and of the same order of thickness, would become very heavily whitened and would rust on the inner surfaces within 14 days of the test. Zinc plating of minimum local thickness of 1.0 mil would not rust but would become heavily encrusted with white corrosion products. Cadmium plating of minimum local thickness of 0.5 mil would behave closely similar to the tin/zinc alloy coatings, and in a thickness of 0.3 mil would be tending to rust on inner surfaces at the end of 25 days.

Table II deals with tin/zinc alloy platings under a hot humidity test in which each daily cycle compromises exposure to an atmosphere of 100 per cent humidity at 140 deg. F., cooling off in the test chamber for the remainder of the day. The minimum local thicknesses of plating on the parts was again in the range of 0.50 to 0.70 mil. Appearance deteriorated in all cases, and rust-

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TABLE I

Behavior of Tin/Zinc Alloy Plated Components under Salt Spray Test.
(Thickness of Plating, minimum local 0.5 mil).

SAMPLE NO.	TIN/ZINC PLATING	PERIOD OF TEST IN DAYS	PERFORMANCE
1.	50/50 Alloy	1	Formation of slight white corrosion products in patches on a darkened background.
		10	White corrosion intensified but still not heavy, and not apparent in inner bends.
		25	Heavier white corrosion products, but still very little attack inside inner bends, and no rusting.
2.	80/20 Alloy	1	Very light white corrosion patches giving mottled appearance on a darker background.
		10	White corrosion a little more intense, but inner bends unaffected.
		25	Little further change, no rusting, inner bends still unchanged.

TABLE II

Behavior of Tin/Zinc Alloy Plated Components under Cyclic Humidity Test at 140 deg. F.
(Thickness of Plating, minimum local 0.5 mil).

SAMPLE NO.	TIN/ZINC PLATING	NUMBER OF WET CYCLES	PERFORMANCE
1.	50/50 Alloy	1	Slight darkening.
		5	Darkening general, and slight white corrosion in some areas. Inside inner bends, no darkening but a number of rust spots evident.
		10	Inside surfaces uniformly covered with tiny rust spots.
		20	White corrosion products general but not heavy on outside surfaces. Heavily rusted areas well defined in and adjacent to inside bends.
2.	80/20 Alloy	1	Slight darkening to an unpleasing appearance.
		5	Further darkening, otherwise little change.
		10	General formation of very light white corrosion products on a dark background. A few rust spots developing in inner bends.
		20	Slight white corrosion a little more marked. A few rust spots on general surfaces, but heavier rusting in and near inner bends.

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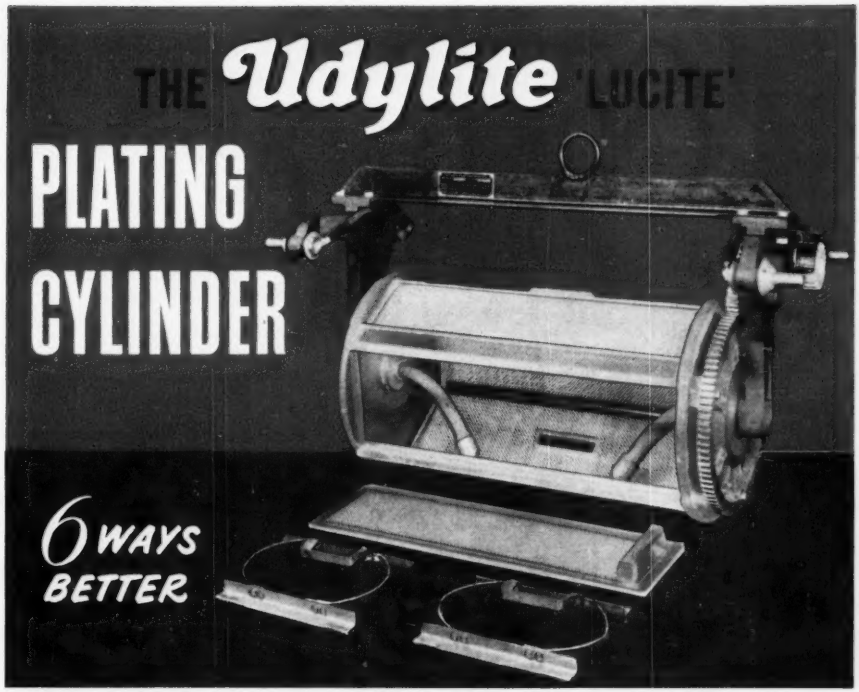

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TABLE III

Behavior of Electroplated Flanged Steel Components under Cyclic Humidity Test at 140 deg. F.

SAMPLE NO.	PLATING	AVERAGE THICKNESS OF PLATING, MIL.	NUMBER OF WET CYCLES TO PRODUCE RUSTING IN FLANGE	GENERAL CONDITION AFTER 6 WET CYCLES
1.	Tin/Zinc, 50/50 alloy	0.40	Two	Marked darkening, with darker color at finger marks; some isolated white corrosion spots and a number of rust spots on main surfaces.
2.	ditto.	0.60	Two	Appreciable darkening, darker at finger marks; some isolated white corrosion spots.
3.	Tin/Zinc, 80/20 alloy	0.15	Two	General dark and streaky appearance with darker finger marks.
4.	ditto.	0.25	Two	Darkening and an evidence of rust spots on main surfaces.
5.	ditto.	0.30	Three	Darkening but appearance better than the thinner platings, Samples Nos. 3 and 4.
6.	ditto.	0.45	Four	— ditto —
7.	Cadmium	0.15	Three	Darkening, especially at finger marks.
8.	Cadmium	0.25	Four	Slight darkening, with darker color at finger marks.

ing occurred in the area of inner bends (areas of lower zinc, higher tin concentration, due to the better throw of the tin) rather early in the test period. The 80/20 alloy performed better than the 50/50 composition. Plain zinc platings would corrode to heavy white zinc products, but both zinc and cadmium minimum local thickness of the order of 0.3 mil would withstand 8 to 10 wet cycles before showing rust at inner bends, and zinc of 1.0 mil and cadmium of 0.4 mil will normally go through the full 20 cycles without rusting.

The tin/zinc alloy coatings, although showing good performances under wet conditions, are somewhat inferior to cadmium plating in this direction. This is confirmed by the results tabulated in Table III. For these a special component was selected. It had a double flange along one edge, such that the interstice so presented was ¼-inch wide and ½-inch deep. Specimens covering various thicknesses of plating, as shown in Table III, were subjected to the hot humidity test, and observations were made of the number of cycles required to cause rusting in the channel-like interstices. Comparing equal thicknesses of plating, cadmium proved to be superior to the 80/20

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tin/zinc alloy, and much superior to the 50/50 alloy.

Cadmium is virtually not available to the plater. The tin/zinc alloy platings offer an alternative finish, which, applied as somewhat heavier coatings, can afford a comparable performance under damp conditions and can give excellent resistance to marine atmospheres. The 80/20 alloy is particularly favored, and it gives properties of solderbility akin to those of cadmium plating, while its amenability to spot welding procedures is superior.

The 80/20 tin/zinc alloy is more attractive than zinc for components for the electrical industry, if soldering or welding is concerned, because zinc is virtually unsolderable when using rosin as flux. Moreover, zinc does not afford the same resistance to "white rusting" under damp conditions.

The tin/zinc alloy platings are established in industry as practicable processess, which yield sound finishes having useful properties. No pretentious claims are made for the processes, nor for the finishes. The former have to be properly installed, operated and maintained, and the latter can serve specific fields with evident advantages.

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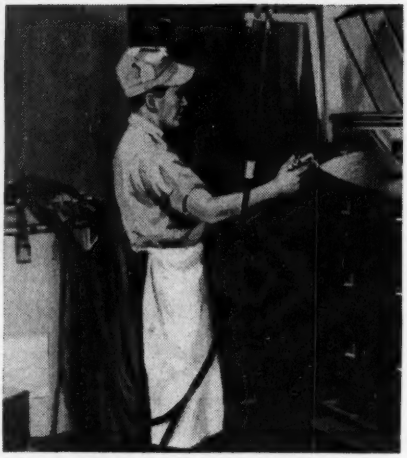

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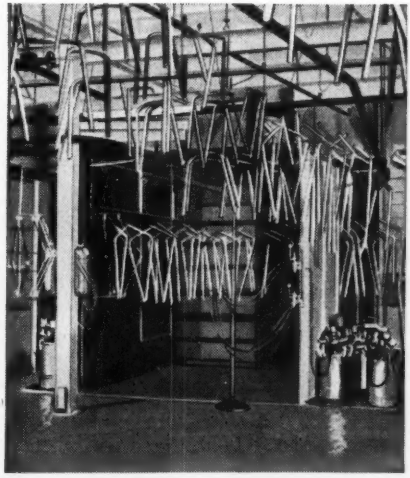

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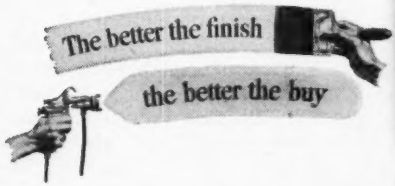

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Washington, D. C.

Spotlighting FINISHING Progress

A Practical Method for Plating on Magnesium

A PROCESS for electroplating on magnesium, developed by the Dow Chemical Company, has opened up new possibilities for finishing this lightweight metal where a bright tarnish resistant surface is essential, or where wear resistance is required. With this process any metal which can be electrodeposited can be successfully applied to magnesium. The plating process consists in the initial application of an immersion zinc coating*, followed by copper striking, and plating in standard baths. Herbert K. DeLong of the Dow Laboratories was directly involved in the development of the new process. Electroplaters will recall that Mr. DeLong described the new porcess before the 36th annual convention of the American Electroplaters' Society. Since that time studies have been continued at Dow on the adhesion and corrosion resistance of plated coatings on various magnesium alloys.

The success of the process, according to studies reported by Dow, depends almost entirely upon the adherence and uniformity of the zinc immersion coating. This coating is extremely thin and although it has not been accurately measured, it is known to be less than 0.0001 inch thick. Electron diffraction studies have shown the coating to be pure metallic zinc.

The adhesion of electrodeposits on magne-

* Process Patent Applied For; License available through the Dow Chemical Company.

By DR. ALLEN G. GRAY

A Monthly Digest of Current Technical Progress Indicating Significant Trends and Developments in the Finishing Industry

Service . . .

the *Randolph* way

Recently the Randolph four-passenger Piper returned from a seven-day, 3,000-mile trip. On it were top Randolph executives completing a heavy schedule of appointments that took them from Tennessee to Illinois, talking to industrialists and business men, visiting plants and offices, concentrating on methods through which Randolph lacquers, enamels, and synthetic finishing products could best serve the needs of this vital part of the country.

This trip is typical of the steadfast policy of the Randolph Products Company to understand at first hand the finishing problems of its customers. It is an important aspect of Randolph service, experience and research, brilliantly keynoted by its modern laboratories staffed by outstanding technicians. The result is keen know-how in step with every need of 20th century enterprise for special types of undercoats, television finishes, aircraft finishes, dopes, thinners, highly specialized production finishes, office equipment finishes.

However rigid the specifications, whatever emergency situation presents itself, Randolph customers know that here is an organization splendidly equipped to provide answers—and the right surface materials.

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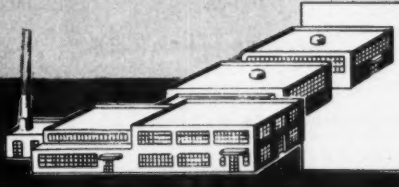

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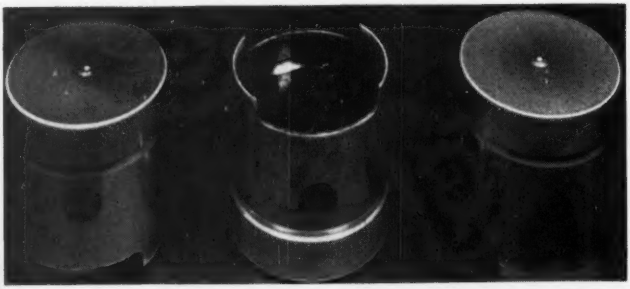

Fig. 1 — Magnesium alloy pistons hard chromium plated. *(Photo courtesy Dow Chemical Co., Midland, Mich.)*

sium alloys appears to be good. Plated coatings have withstood heating to the melting point of the magnesium alloy (1100-1200 deg. F.) in Dow Laboratory tests without a general lifting or blistering of the deposits. Plated castings have withstood heating to 450 deg. F. and higher, depending upon the initial quality of the castings. Figure 1 shows magnesium alloy pistons given a hard chromium deposit by plating with 0.0005 inch copper plus 0.001 inch chromium. Copper and silver plated surfaces have been joined by soft soldering without disrupting the adhesion. Deposits have been hammered and bent without failure. Heavy chromium deposits have been applied to articles for wear resistance without a tendency for peeling of the plate. Figure 2 shows chromium plated magnesium printing cylinders. Figure 3 shows an aircraft control wheel magnesium casting that has been given a conventional copper-nickel-chromium bright finish.

Corrosion Tests

Corrosion tests such as salt spray, high humidity, interior exposure and exterior exposure have been made by Dow Laboratories to determine the durability of plated magnesium parts over a period of several years. In general, these tests have indicated good performance. Service conditions usually determine the plating cycle required for any base metal. Tables I and II summarize the latest results of atmospheric exposure tests conducted by Dow to assist in arriving at recommendations for the proper plating thicknesses on magnesium parts. Table I gives results on plating thickness vs protective value in industrial atmosphere exterior exposure; Table II gives similar data for exposure under rural conditions. Figure 4 shows typical magnesium parts plated with various thicknesses of copper-nickel chromium after two years' exposure under rural conditions.

For decorative copper-nickel-chromium plating of magnesium parts the thicknesses recommended by Dow are summarized as follows:

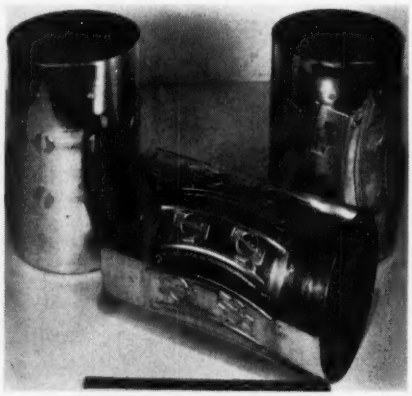

Fig. 2—Chromium plated magnesium printing cylinders. *(Photo courtesy Dow Chemical Co., Midland, Mich.)*

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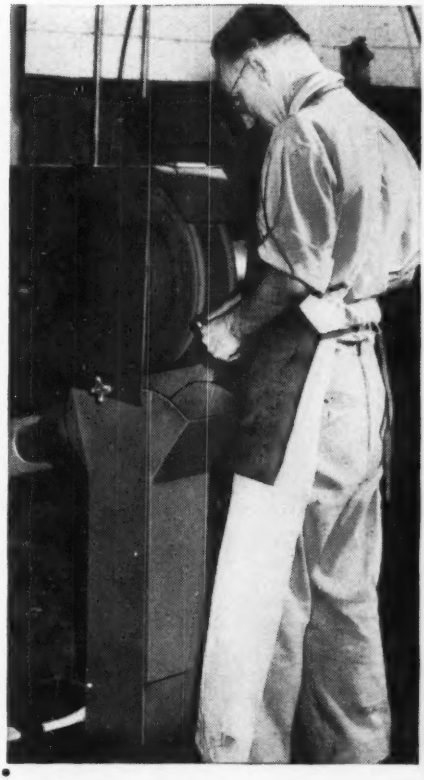

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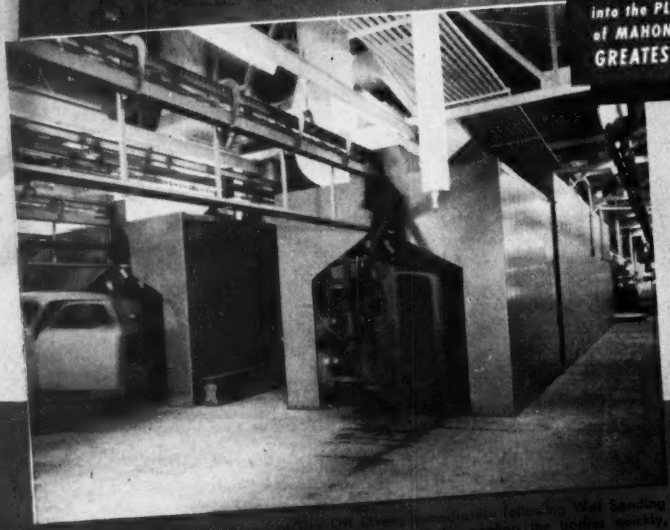

Illustrated Above is a Tack-Off Booth at the entrance to a Two-Tone and repair Finish Coat Spray Booth. Filtered Air is supplied to this Tack-Off Booth and is maintained at slightly higher pressure to exclude factory dust from settling on bodies after Tack-Rag operation. This equipment is part of a complete Mahon Automobile Body Finishing System.

M

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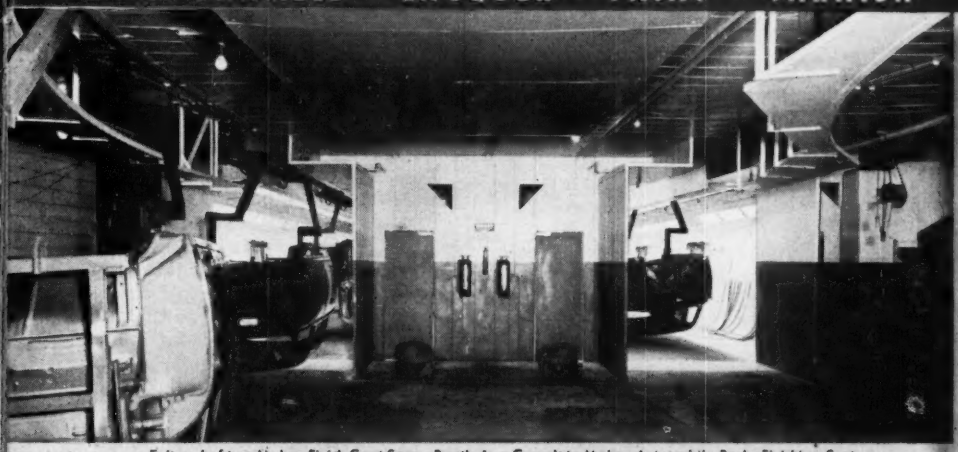

Exit end of two Mahon Finish Coat Spray Booths in a Complete Mahon Automobile Body Finishing System.

MODERN FINISHING EQUIPMENT Simplifies Production, Provides Better Working Conditions, Reduces Cost, Ups Quality!

The equipment illustrated on these pages is some of the major units of a Complete Mahon Finishing System specially designed to meet the exacting requirements of a large automobile manufacturer. It is modern in every detail . . . into it has been engineered many new features which reduce maintenance, provide better working conditions, and produce finer finishes at lower cost. These developments are the result of research and experimentation which goes on constantly in Mahon laboratories in the perfection of new methods and better equipment to produce better results in production finishing. No matter what your finishing equipment requirements may be, you can depend on Mahon for modern equipment engineered to do your particular job efficiently and economically. There is no substitute for experience in this highly specialized field. That is why so many manufacturers all over the world pay a little more for modern Mahon equipment . . . they know that in thirty years of pioneering leadership Mahon engineers have accumulated a wealth of technical knowledge and practical know-how not available to them elsewhere. See Mahon's Insert in Sweet's Mechanical Industries File for complete information or write for Catalog A-650.

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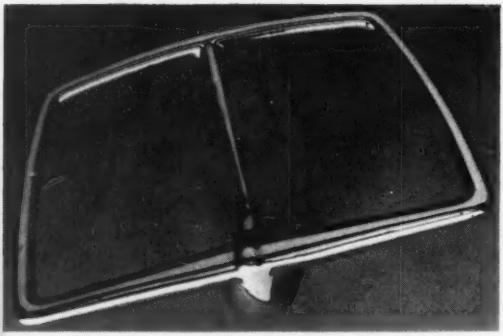


Fig. 3—Aircraft control wheel made from a magnesium casting, and finished with bright copper-nickel-chromium.
(Photo courtesy Dow Chemical Co., Midland, Mich.)

Type of Service Environment	Suggested Minimum Total Plate Thickness Inches
Interior	0.0075 — 0.001
Mild Exterior	0.00125
Average Exterior	0.0015
Severe Exterior	0.002

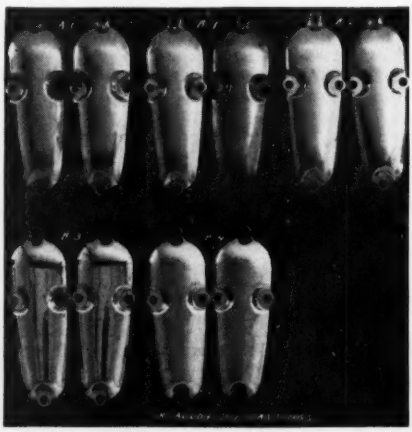
Basis of Plating Method

Magnesium, being less noble than any of the common metals, readily replaces many of them from solutions of their salts. In acid solutions the immersion coatings are non-adherent and powdery, while in strongly alkaline solutions the coatings are more adherent, but insufficiently so as to afford a base for electrodeposits. Most alkaline compounds, with the exception of pyrophosphates, do not attack magnesium. It was through the discovery that pyrophosphates did react with magnesium that the present method of zinc coating magnesium was developed. Pyrophosphates will readily dissolve oxide and hydroxide coatings from magnesium and actually brighten the surface. By the addition of certain zinc salts to the pyrophosphate solutions an adherent zinc film is formed.

The quality of the zinc immersion deposit was found to depend to a marked extent on the rate of deposition and also the ratio of zinc to pyrophosphate. Too rapid a rate of deposition caused less adherent coatings to form and, therefore, various inhibiting salts were added to control the reaction rate. It was found that fluorides in small amounts were very effective and gave a much finer grained zinc deposit, as well as assisting in controlling the rate of formation of the immersion coating. The pH of the zinc bath is important, as is the use of carbonates in adjusting and maintaining this factor in the proper range.

Utilizing the above discoveries, the

Fig. 4—Magnesium parts plated with various thicknesses of copper-nickel-chromium after two years' exposure test under rural conditions by the Dow Chemical Company.
A-1—0.0015 inch total plate thickness
B-1—0.001 inch total plate thickness
B-2—0.00125 inch total plate thickness
B-3—0.0015 inch total plate thickness (Nickel Buffed)
B-4—0.002 inch total plate thickness (R Alloy Die Castings)



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Application shown thru courtesy of A. N. BROOKS CO. 500 So. Michigan Ave. Chicago, Ill.

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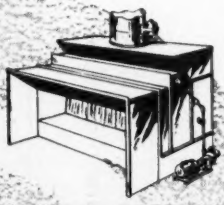

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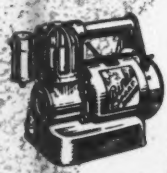

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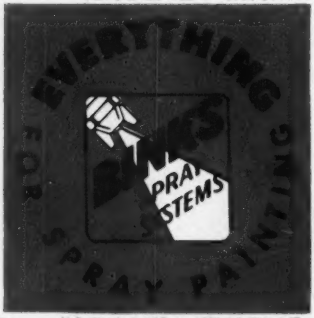

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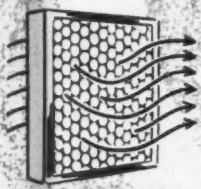

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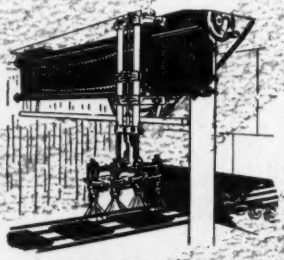

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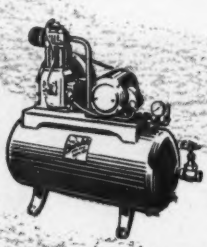

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TABLE 1

Summary — Corrosion Data

Plating Thickness vs. Protective Value

Exterior Exposure — Industrial (Chemical Plant) Atmosphere

Procedure Ident.	Plate Thickness (Inches) Copper	Nickel	Chome	Silver	Total	Buffing	% Attack (Average — 2 Panels) 1 Month M Sheet	FS-1 Sheet	R Die Cast	3 Months M Sheet	FS-1 Sheet	R Die Cast	6 Months M Sheet	FS-1 Sheet	R Die Cast	1 Year* M Sheet	FS-1 Sheet	R Die Cast
CHROME																		
A-1	0.0005	0.001	0.00002	—	0.0015	None	OK	OK	OK	OK	OK	OK	OK	6	2	3	14	4.5
A-2	0.001	0.001	0.00002	—	0.002	None	OK	OK	—	OK	OK	—	OK	5	—	2.5	10	—
A-3	0.0015	0.001	0.00002	—	0.0025	Copper	OK	OK	—	OK	OK	—	OK	OK	—	OK	OK	—
B-1	0.0005	0.0005	0.00002	—	0.001	None	OK	OK	OK	1.5	14	5	10	35	15	33	45	27
B-2	0.0005	0.00075	0.00002	—	0.00125	None	OK	OK	OK	0.5	5	2	3	10	7	8	21	11
B-3	0.0005	0.001	0.00002	—	0.0015	Nickel	OK	OK	OK	OK	OK	OK	OK	2	OK	4.5	5	OK
B-4	0.0005	0.0015	0.00002	—	0.002	None	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	1.5	OK

* Electrodeposits are being attacked by atmospheric conditions encountered in this type exposure. From 40-80% of the plated surface shows fine to medium sized pits in the deposits. Much of this pitting has not entirely penetrated to the magnesium surface, particularly with the heavier deposits. High SO_2 and Cl in atmosphere.

Tests Conducted by Dow Chemical Laboratories.

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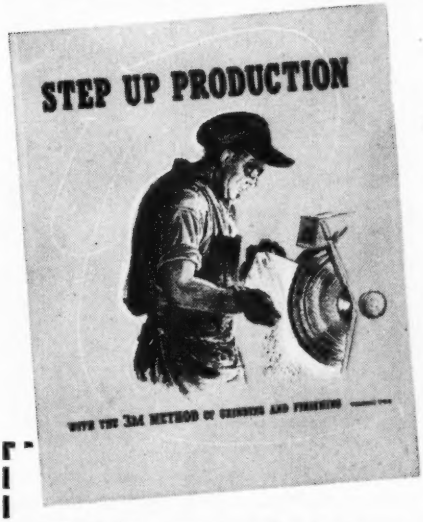

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TABLE II

Summary — Corrosion Data
Exposure Tests On Electroplated Magnesium
Plate Thickness vs. Protective Value
Exterior Exposure (Rural)

Procedure Ident.	Plate Thickness (Inches) Copper	Nickel	Chome	Silver	Total	Buffing	% Attack (Average — 2 Panels) 1 Month M Sheet	FS-1 Sheet	R Die Cast	3 Months M Sheet	FS-1 Sheet	R Die Cast	6 Months M Sheet	FS-1 Sheet	R Die Cast	1 Year M Sheet	FS-1 Sheet	R Die Cast
CHROME																		
A-1	0.0005	0.001	0.00002	—	0.0015	None	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
A-2	0.001	0.001	0.00002	—	0.002	None	OK	OK	—	OK	OK	—	OK	OK	—	OK	OK	—
A-3	0.0015	0.001	0.00002	—	0.0025	Copper	OK	OK	—	OK	OK	—	OK	OK	—	OK	OK	—
B-1	0.0005	0.0005	0.00002	—	0.001	None	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	1.5
B-2	0.0005	0.00075	0.00002	—	0.00125	None	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
B-3	0.0005	0.001	0.00002	—	0.0015	Nickel	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK*
B-4	0.0005	0.0015	0.00002	—	0.002	None	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
SILVER																		
C-1	0.0005	Strike	—	0.001	0.0015	None	OK	OK	—	OK	OK	—						
C-2	0.0005	0.0001	—	0.002	0.0025	None	OK	OK	—	OK	OK	—						
C-3	0.001	0.0001	—	0.001	0.002	None	OK	OK	—	OK	OK	—						
C-4	0.0015	0.0001	—	0.001	0.0025	Copper	OK	OK	—	OK	OK	—						
C-5	0.001	0.0001	—	0.001	0.002	Silver	OK	OK	—	OK	OK	—						

Discontinued at 3 months. Silver tarnished to a uniform black. No corrosion of magnesium.

* Slight attack in porous area of one panel.

Tests Conducted by Dow Chemical Laboratories.

	2 years		
A-1	OK	OK	OK
A-2	OK	OK	—
A-3	OK	OK	—
B-1	3	5	2.5
B-2	OK	OK	OK
B-3	1.5	0.5	OK*
B-4	OK	OK	OK

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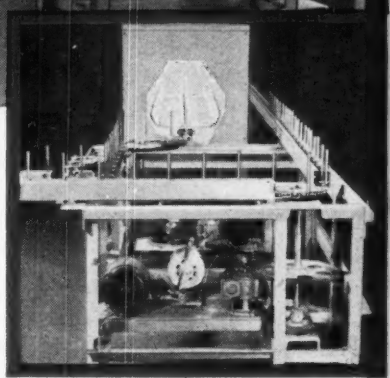

Manufacturing breather caps for oil filler pipes was nothing new for this manufacturer—he'd been doing it for years—had even rigged up an infrared oven of sorts which did a "good enough" job of baking a final finish. That was before production demands doubled, finish specifications became more critical and sizes began varying.

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following basic steps are required in electroplating on magnesium:

1. Surface Conditioning
2. Activating Pickling
3. Zinc Immersion Coating
4. Copper Striking
5. Standard Plating

Surface Conditioning for Plating

If a smooth, highly polished surface is desirable, the magnesium parts may be wheel polished and buffed. Small parts may be tumbled and burnished. Blasted surfaces are highly reactive and not suitable for plating unless pickled afterwards.

Where grease, buffing compounds, and similar oily matter are present on magnesium parts, solvent rinsing, vapor degreasing or solvent emulsion cleaning may be used to great advantage. Heavy duty alkaline cleaners of the type used for cleaning steel are satisfactory for magnesium. Such cleaners are also effective in removing chrome-pickle or dichromate coatings which interfere with preplating treatments. A satisfactory cleaner recommended by the Dow Chemical Company has the following composition:

Sodium carbonate .....3.0 oz./gal.
Sodium hydroxide .....2.0 oz./gal.

The cleaning bath is operated hot at 180-212 deg. F. and cleaning times range from 3 to 10 minutes. In some cases parts are simply immersed in the solution. Under these conditions, 0.1 oz./gal. of soap is sometimes added to assist in removal of oil films. If direct current is available at the cleaning tank the magnesium parts are made cathodic in the bath and a current density of 10 to 40 amp./sq. ft. at 6 volts is applied. Cathodic cleaning requires less time than hot cleaning alone. Following cleaning, parts are thoroughly rinsed in cold running water.

A bright pickle solution may be used to remove previously applied chromate type coatings as well as assisting to produce a bright base metal surface for plating. Magnesium parts, whether

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cast or wrought, may be bright pickled 30 seconds to two minutes in a concentrated solution of the following composition:

Chromic Acid	37½ oz./gal.
Nitric Acid	3¼ fl. oz./gal.
Hydrofluoric Acid	1 fl. oz./gal.

Where only wrought magnesium parts are to be plated, the following treatment solution is recommended as being more economical to use:

Chromic Acid	24 oz./gal.
Sodium Nitrate	4 oz./gal.
Calcium or Magnesium Fluoride	⅛ oz./gal.

The wrought parts are immersed for 30 seconds to two minutes at room temperature (70-90 deg. F.) in this bath. After treatment, the bright pickled parts are rinsed immediately in cold running water, then in hot water.

In some cases, where little dimensional change or even minor loss of detail cannot be tolerated, such as with photoengraved printing plates (Fig. 2), the parts are immersed 2 to 5 minutes in a bath consisting of 24 oz./gal. of chromic acid, operated at room temperature. After bright pickling or chromic acid treating, the magnesium parts must be freed of any chromium films by cleaning for 3 to 5 minutes in either a solution of 4 oz./gal. sodium hydroxide or 2.4 pints/gal. of hydrofluoric acid (48-52 per cent HF). These baths are used at room temperature. Following the above treatment, parts are again hot water rinsed.

In order to activate the magnesium surface to receive the immersion coating used in the Dow plating process, parts should be pickled 1 to 5 minutes at room temperature in a bath of the following composition:

Phosphoric Acid (conc.)	1.6 pints/gal.
Sodium or potassium acid fluoride	13-1/3 oz./gal.

This solution removes average contamination on magnesium without a roughening etch, as well as activating it to receive the zinc immersion coat-

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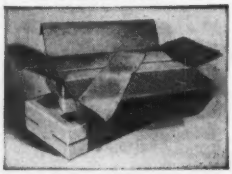

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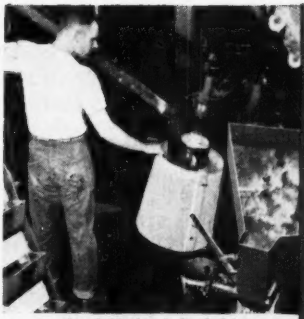
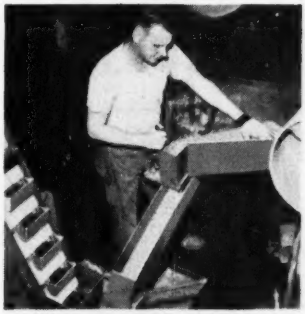


Unplated BB shot is loaded into plating basket by a chute.

After being plated the shot is dumped by the revolving basket.



This tray receives the plated shot and funnels it into a conveyor.

Stevens Small Parts Plating Machine similar to the one in use at Daisy.

Plating air rifle BB ammunition is an unusual application for a huge plating machine, but the Stevens unit at Daisy Manufacturing Company, Plymouth, Michigan, is bringing new profits and efficiency to this operation. Formerly barrel plating was used to give the pellets their copper coating and it was an unwieldy and laborious process.

But with their Stevens machine, Daisy has been able to install an ingenious conveyor system that requires no manual handling from the time the pellets are formed until they are ready for shipping.

If you have a plating problem, call in your nearby Stevens representative or write direct to Frederic B. Stevens, Inc., Detroit 16, Mich.

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ing. Parts activated in this solution may not require the acid pickling previously described, unless the parts are obviously corroded or have been previously chemically treated with chromate type coatings.

Zinc Immersion Coating

The following solution has been found most suitable for applying the zinc immersion coating pretreatment to standard magnesium alloys:

Tetrasodium pyrophosphate	16	oz./gal.
Zinc sulfate	4	oz./gal.
Potassium fluoride	0.94	oz./gal.
or		
Sodium fluoride	0.67	oz./gal.
Potassium or sodium carbonate	0.67	oz./gal.

The bath is prepared by first dissolving the zinc sulfate monohydrate in water at room temperature. The solution is then heated to 140-180 deg. F. and the tetrasodium pyrophosphate added. A fluffy precipitate forms and then dissolves after further stirring for 5 to 10 minutes. After the precipitate is completely dissolved, the fluoride is added. Following this, the carbonate is added to adjust the pH to the range 10.0 to 10.6, with a 10.2 to 10.4 range preferred. More or less carbonate than the quantity shown may be required to obtain the proper pH value of the solution. Carbonate should be added slowly and pH checks made to ascertain the proper pH value. The pH can be determined either colorimetrically with papers (Hydrion paper, with range 10-12 is suitable) or electrometrically with a pH meter fitted with a standard glass electrode.

The zinc immersion bath is operated at 175-185 deg F.; the solution is mildly agitated and the parts are immersed 3 to 5 minutes. The three-minute limit is recommended for Dowmetal M alloy and 5 minutes for other magnesium alloys. The treatment time will vary as a result of such factors as temperature of operation, alloy, freshness of the bath, and method of prepickling. In any case the time of immersion

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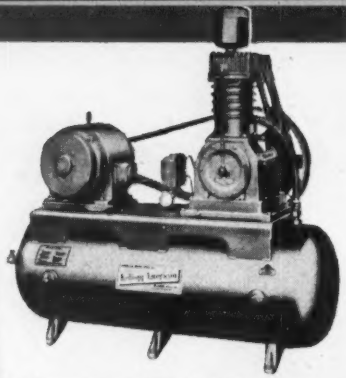

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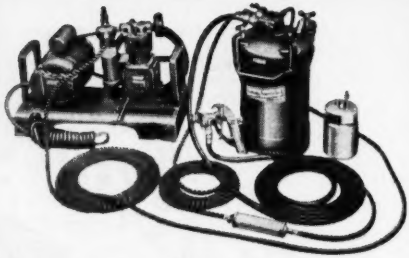

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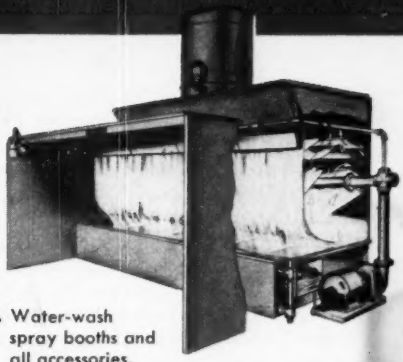

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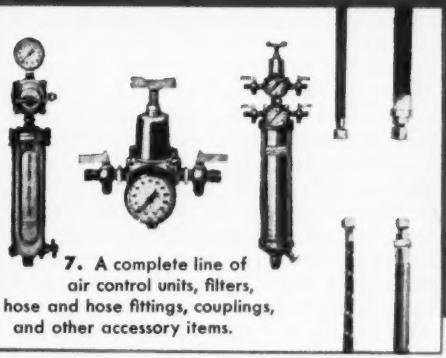

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should be no longer than the period required for complete coverage of the part with a zinc deposit.

Upon immersion of the magnesium parts in the treatment solution there is an immediate evolution of gas and the surface brightens somewhat due to oxide removal. Once the surface is free of oxide the zinc film starts to form, and the surface gradually acquires the typical blue-gray color of the zinc. After a continuous zinc coating has been formed, the gas evolution subsides and no further buildup of zinc occurs. This immersion is followed by cold water rinsing only.

Copper Striking

Immediately after rinsing from the zinc immersion treatment, the magnesium parts are given a copper strike. One bath recommended by Dow has the following composition:

Copper cyanide	5.5 oz./gal.
Sodium cyanide	6.8 oz./gal.
Sodium carbonate	4.0 oz./gal.
Rochelle Salt	6.0 oz./gal.
Free cyanide	0.75 oz./gal.

As made up, this bath has a pH of 10-11. For best operation the pH should be adjusted to 12.2 to 12.8 with sodium hydroxide. This bath is operated at 150-160 deg. F. with cathode rod agitation preferred.

A fluoride modified copper strike bath using all potassium salts has also been recommended by Dow. The preferred operating temperature for this bath is 140 deg. F. The composition of this bath is as follows:

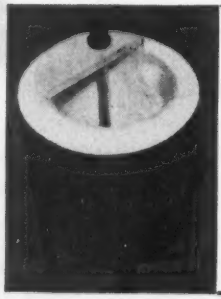
Copper cyanide	3.5 oz./gal.
Potassium cyanide	6.1 oz./gal.
Potassium carbonate	2.0 oz./gal.
Potassium hydroxide	1.0 oz./gal.
Potassium fluoride	4.0 oz./gal.
Free cyanide	1.0 oz./gal.

The recommended pH range for this bath is 12.8-13.2.

With either of the strike baths, electrical contact should be made quickly and a high current density of 30 to 40 amp./sq. ft. should be applied for the first 30 seconds to 1 minute if deeply recessed parts are being plated. Prolonged high current density striking is avoided as it may cause inferior adhesion and possible subsequent blistering. After the 30 seconds to 1 minute initial deposition period, the current density is decreased to 15 to 25 amp./sq. ft. and plating continued for at least 5 minutes, or longer if maximum brightness is desired, or if it is not planned to copper plate in a higher efficiency copper plating bath. Dow reports that periodic current reversal has been used to advantage in operations with the copper strike bath. In using periodic reversal with the copper strike, plate the first 30 seconds to 1 minute on the forward cycle, and then apply a 15-second forward and 3-second reverse plating cycle.

Plating Baths

In general, plating baths and procedures used with other metals can be used in plating magnesium parts. Certain specific recommendations that have been made by Dow technologists



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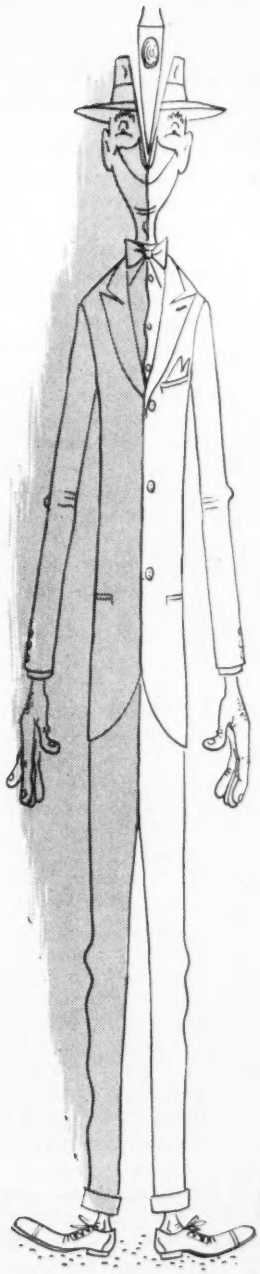

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who have worked with the process are summarized below:

Copper Plating. Copper can be plated in heavier thicknesses by prolonging the time in the initial strike bath or by transferring the work to other alkaline copper cyanide or pyrophosphate type baths. Conventional bright copper plating baths are satisfactory for building up the copper thickness after an initial copper strike has been applied, using previously described procedures.

Nickel Plating. Nickel may be applied from any of the regular commercial baths after copper plating. It is preferable that the nickel bath have a pH of about 4.0 or above, but satisfactory results have been obtained in lower pH baths. An initial copper plate of about 0.0003 inch minimum thickness must be applied to prevent attack of the magnesium through the pores in the copper. As much as 0.0008 inch of copper may be required on deeply recessed parts to ensure a minimum 0.0003 inch in pockets and holes.

Cadmium and Zinc Plating. In plating zinc direct from a regular cyanide bath over the zinc immersion coating, electrical contact must be made before introducing the work into the solution, or immediately thereafter. Plating over the initial copper strike has produced better results than application directly over the zinc immersion coating. This has been found to be particularly true for cadmium plating.

Brass Plating. Brass may be applied either directly to the zinc immersion deposit from a standard cyanide type bath, or after the initial copper strike.

Silver Plating. Silver may be applied from conventional cyanide baths after the initial copper strike, but the best practice is to plate heavier copper, and apply a nickel strike before silver.

Chromium Plating. Copper-nickel-chromium deposits are readily applied. Chromium may be applied after copper striking for applications where wear resistance is of primary importance.

Barrel Plating. Small magnesium parts can be processed by barrel plating methods essentially the same as used with other metals. The zinc immersion coating is best applied in a plating barrel that is revolved very slowly or intermittently, during the treatment. The barrel must be insulated electrically from the tank to insure a proper immersion coating. Dow reports that no difficulty has been experienced with scratching the thin zinc coating, or loss of electrical contact when copper striking the immersion zinc coated parts. It appears that the electrodeposits are scratched less during the tumbling plating operation because of the lightness of the load as compared to equivalent batches of heavier steel parts. Copper, copper-nickel, and black nickel coatings have been applied in a conventional plating barrel. Bright barrel plated nickel is possible without the necessity for buff-

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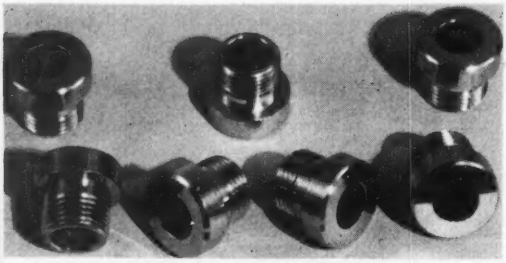

Fig. 5—Barrel plated magnesium alloy screw machine parts. *(Photo courtesy Dow Chemical Co., Midland, Mich.)*

ing the nickel before rack chromium plating. Figure 5 shows magnesium alloy screw machine parts barrel plated in copper-nickel followed by rack chromium plating.

Stripping of Deposits. In stripping deposits from magnesium, care must be taken to avoid severe etching of the surface. Dow reports that copper may be stripped using the hot alkaline polysulfide dip followed by a dip in cyanide. To remove nickel, the work is made the anode in an aqueous bath containing 15-25 per cent hydrofluoric acid and 2 per cent sodium nitrate at a potential of 4-6 volts. The nickel goes into solution over a wide range of current densities in this bath, and the exposed magnesium surface polarizes completely due to the formation of magnesium fluoride. Unsatisfactory zinc immersion coatings can be stripped in 15 per cent hydrofluoric acid, then the surface reactivated and again given the zinc immersion dip pretreatment. Chromium may be removed by treating the work anodically in a hot alkaline carbonate and/or hydroxide solution.

Racks For Plating. Conventional non-magnesium racks may be used in the magnesium plating process. Organic rack coatings should be used to confine the exposed rack area to a minimum for electrical contact with the magnesium. The racks should be given a copper plate, or a copper strike after each cycle when used in electroplating metals other than copper, brass, bronze, zinc or cadmium.

Control of Plating Process

The zinc immersion bath can be analyzed and replenished by additions of pyrophosphate and zinc. The fluoride is lost primarily by dragout and need be added only at infrequent intervals. Carbonate is required only as a means of pH adjustment. The presence of heavy metal salts, other than zinc, must be kept at a minimum. Chromium salts particularly tend to inhibit the zinc coating formation if present in quantities greater than a few hundredths of one per cent. Analytical methods for controlling the zinc immersion bath during the process of electroplating on magnesium have been worked out by the Dow Laboratories. Zinc sulfate is determined by titration of the zinc with a solution of potassium ferrocyanide. Sodium pyrophosphate is determined using the molybdate method. After removal of the zinc the phosphate is precipitated as ammonium phospho-molybdate, washed free of acid and titrated with 0.1N sodium hydroxide. An alternate method for determination of sodium pyrophosphate is by precipitation as zinc pyrophosphate. In the determination of potassium fluoride, the fluorine is separated from interfering elements by steam distillation as hydrofluosilicic acid. The distilled fluorine is titrated in aqueous solution with standard thorium nitrate using an aqueous alizarine red solution as an indicator.

Depletion of the dilute bright pickle solution used for wrought products

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can be detected readily by lack of chemical action. At this point the pH is likely to be 1.7 or higher and small batches of the solution should be thrown out. Large tanks can be revivified about 4 times by an addition of chromic acid to bring the solution back to the original pH of 0.5-0.7. Control of the concentrated bright pickle solution used for castings requires routine chemical analysis to determine the amounts of chromates, nitrates, and fluorides necessary to bring the bath to its original concentration. Lack of chemical action and brightness indicates depletion of the solution.

A NEW method of making fine wire less than 1/10 the thickness of human hair has been described by Dr. Howard T. Francis, supervisor of electrochemistry research at Armour Research Foundation of Illinois Institute of Technology.

In cooperation with the Naval Ordnance Laboratory, Foundation scientists have produced 0.00015 inch diameter wire in the laboratory. In the new method, Dr. Francis explains, wire passes through a chemical bath in which an electric current is flowing. The process polishes away the wire's surface. The wire becomes an electrode in an electroplating bath and is dissolved away to the desired size.

Wire is normally made by drawing metal through successively smaller holes until a desired diameter is reached. The new electrochemical method of making extremely fine wire amounts to an eating away of surface metal rather than a mechanical drawing operation.

One use of fine wire may be in making smaller, more compact electronic equipment. Delicate scientific instruments could also be made more sensitive with extremely thin wire.

The Foundation plans further research on the method, Dr. Francis said. The electrochemists would like to know how the process works with various metals and just how fine a wire can be made and used practically.

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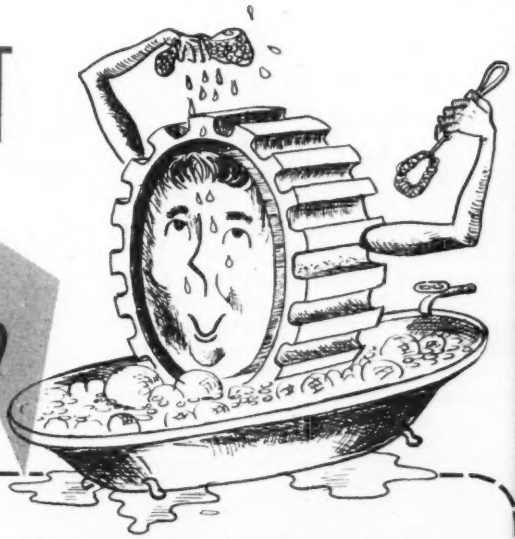

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WHEN the Independent Pneumatic Tool Company added beauty to the utility of its line of portable power tools by introducing its "Silver Line" saws, impact wrenches, drills, grinders, disc and belt sanders, and polishers, some of which are illustrated in Fig. 1, it became necessary to expand the polishing and buffing facilities in the modern Aurora plant. Thor "Silver Line" tools have cast aluminum housings which are polished and buffed to a high luster, thus producing the gleaming silver-like finish from which the line gets its name.

Modern equipment to accomplish the polishing and buffing operations required to finish the Thor portable power tools includes a number of conventional polishing lathes equipped with set-up wheels, polishing lathes in combination with backstands for use with abrasive belts (see Fig. 2), and buffing lathes for the final finishing operation (see Fig. 3).

The aluminum housings are die cast or sand cast according to the size and

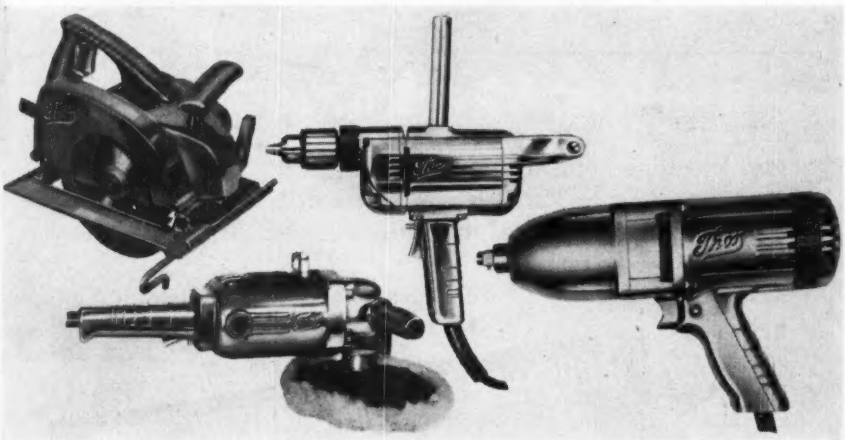


Fig. 1(left to right)—Thor 6-Inch "Silver Line" Saw, Heavy Duty "Silver Line" Polisher, ½-Inch "Silver Line" Drill, and ⅜-Inch "Silver Line" Impact Wrench
(Photos courtesy Independent Pneumatic Tool Co., Aurora, Ill.)

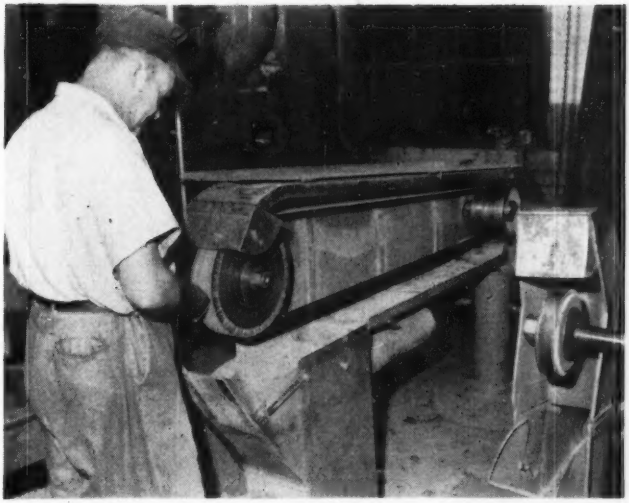


Fig. 2—On this Standard Electrical Tool polishing lathe used in conjunction with a Porter - Cable backstand, aluminum die castings are polished with a 120 emery abrasive belt (both 3M and Behr-Manning belts are in use). Photo was taken with belt guard raised in order to show more clearly the polishing lathe and accessory equipment. *(PRODUCTS FINISHING Staff Photo)*

shape of the part in question. The finishing procedure for the aluminum die castings is as follows:

1. Polish on a 120 emery abrasive belt.
2. Polish on a 250-280 emery abrasive belt (lubricated).
3. Buff on a sewed section buffing wheel using tripoli buffing composition.

The finishing procedure for the aluminum sand castings is as follows:

1. Polish on an 80 emery set-up wheel.
2. Polish on a 120 emery set-up wheel.
2. Polish on a 250 emery set-up wheel or abrasive belt using 180 emery cake lubricant.
4. Buff on a sewed buffing wheel using tripoli buffing composition.

Fig. 3—"Silver Line" tool housings receive the final buffing operation on this Hammond buffing lathe equipped with sewed buffing wheels. In the background of the illustration can be seen one of the American Air Filter Roto-Clone water - wash dust eliminators which collects the dust-laden air from the polishing and buffing operations, filters and washes out the dust, and returns the fresh air to the finishing room. *(PRODUCTS FINISHING Staff Photo)*

The choice of set-up polishing wheels or abrasive belts for the polishing operations depends on the surface condition of the casting and the irregularity of its shape.

Plating Processes

Although for the aluminum parts forming the exterior housings of the Thor tools the final buffing operation produces a highly satisfactory finish, certain steel working parts contained in the tools must be plated with various metals to present a pleasing appearance, as well as to resist corrosion and secure satisfactory tool operation. Some steel parts after forming are degreased in a Blakeslee vapor degreaser, then alkali cleaned in an electrocleaner, and cadmium plated for rust resistance. Other parts are cleaned and tin plated to eliminate the possibility of galling while the finished product is in use. Still other parts receive a Du-Lite black finish, providing them with a pleasing finish which at the same time resists corrosion.

The specification finishes applied to the various parts of the "Silver Line" portable power tools all contribute to the quality, efficient operation, and sales appeal of these products.

"We had a hard time deciding on your wedding gift."
(Courtesy MODERN MACHINE SHOP)

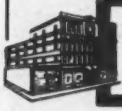
The use of salt and other chemicals to melt ice on wintry northern streets has caused much corrosion damage to the underbody and fenders of cars. Now, newly developed melting salts actually inhibit rust formation.

—(The Ohmite News.)

IS YOUR PROBLEM
POLISHING?

HOLLAND SUGGESTS:
Twin motor double spindle vee belt drive heavy duty buffing and polishing lathe. 3-15 H.P.

Contact our technical staff on your metal finishing problems. Write for FREE folder "M" showing our wide selection of metal finishing equipment.



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Write
Sulphur Products Co.
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for
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Information on Copper Stripping

Gives your metal products SALABILITY at lower cost!

The rising cost and growing scarcity of plating materials doesn't worry users of HOUGHTO-BLACK. This inexpensive chemical treatment gives metals a handsome, permanent, protective black coating —lustrous, glossy or a dull jet black. You can apply HOUGHTO-BLACK in mass production *without special equipment.* You can coat parts made of *different* steels uniformly even if made at different times.

You will find HOUGHTO-BLACK has many advantages other than these brief features listed at right. Send for our new bulletin that describes the fast, easy-to-use HOUGHTO-BLACK process. Write to E. F. Houghton & Co., Philadelphia 33, Pa.

HOUGHTO-BLACK FEATURES

- Durable, uniform finish for metals and alloys
- Low in cost, fast and easy to use
- Won't alter dimensions of close-tolerance parts
- Simple one-bath process
- Rust-resistant—assures extra salability

HOUGHTO-BLACK
. . . a product of

E F HOUGHTON & CO.
PHILADELPHIA · CHICAGO · DETROIT · SAN FRANCISCO

Ready to give you on-the-job service . . .

NEWS of the Industry

NEW PLANTS

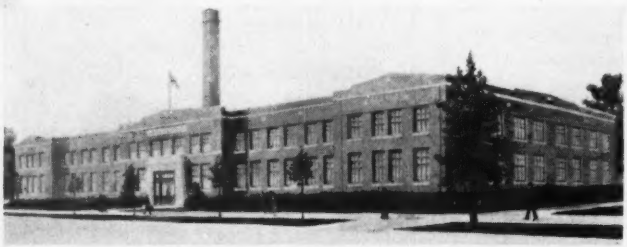
GENERAL ANILINE & FILM CORP., New York 17, N. Y., is increasing its production facilities for detergents and other surface active agents with new construction and equipment representing an investment of more than $2,000,000. This information was disclosed by Dr. Cary R. Wagner, vice president in charge of operations, at a two-day sales managers' conference.

The conference was called for the purpose of acquainting the sales managers with the special list of chemical products, including detergents, wetting agents and other surface active agents, which are now being sold through the Antara Products Division of General Dyestuff Corporation. Antara, a former division of General Aniline, was recently merged with General Dyestuff Corporation through which General Aniline dyes and textile auxiliaries have been sold.

The new facilities disclosed by Dr. Wagner are for the Grasselli, N. J., and Rensselaer, N. Y., plants of General Aniline. Some were recently completed and placed in operation, while others will be available in 1951.

Wallace Carroll, president of the **SIMPSON ELECTRIC COMPANY** of Chicago, has announced the leasing of a plant at 932 Benton Street, Aurora, Illinois. This makes a total of five factories now producing panel instruments and test equipment for Simpson. Three factories are in Chicago, and the fourth was opened at Lac du Flambeau, Wisconsin, four years ago.

The Aurora factory, which was formerly tenanted by the Elgin National Watch Company, is a modern, fireproof structure covering a total area of 31,000 square feet. The two-story building provides ideal working conditions and employee facilities.



Newly leased plant of the Simpson Electric Company

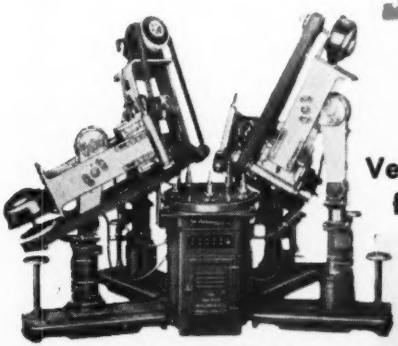
COMPANIES

MACDERMID INCORPORATED of Waterbury, Connecticut, has announced the appointment of Donald Sales and Manufacturing Co., 6601 W. State St., Milwaukee 13, Wis., as exclusive distributors in Wisconsin for its complete line of metal cleaners, bright copper and other metal finishing preparations.

T. F. O'Brien, MacDermid sales engineer, will be available for customer service concerning any metal finishing problems.

STEEL PROTECTION & CHEMICAL CO., INC., Mooresville, Ind., specialist in electrolytic lead plating of small parts primarily for the automotive industry, has recently expanded its metal finishing

THEY'LL EVEN DO YOUR SPECIALIZED JOBS!

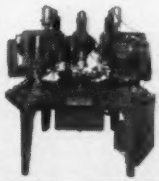


NO. 4-5 ROTARY INDEXING

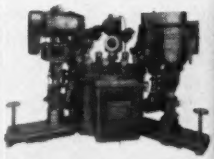
The #4-5 Rotary Indexing Packer-Matic equipped with abrasive belt heads. Uses buffs, polishing, tampico, wire wheels or belts.

For DOUBLE Efficiency . . .

Versatile STANDARD Packer-Matics for routine jobs and "Specials"



NO. 9-6 ROTARY INDEXING



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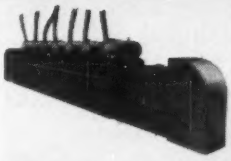

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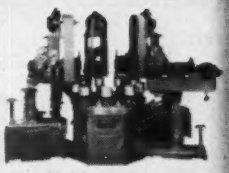
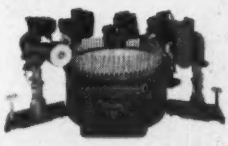
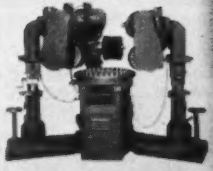


NO. 14-9 ROTARY INDEXING



NO. 13 CONTINUOUS ROTARY



NO. 4-24 CONTINUOUS ROTARY

● Thanks to their extreme flexibility, Packer-Matics are giving a highly accurate, automatic finish to a far greater variety of items . . . and are saving industry thousands of man hours every day.

Jobs you've always considered too specialized for an automatic machine are routine tasks for the versatile standard Packer-Matic. Silverware, household appliances, cosmetic accessories, hardware, plumbing supplies . . . regardless of shape, metal, or finish no job is too difficult.

Call on Packer-Matic engineers for information . . . and instruction in up-to-the-minute buffing techniques. Like the performance of our machines, the service of our engineers can help you add hours of efficient production to every working day.

AUTOMATIC

PACKER-MATIC

AUTOMATIC MACHINES FOR BUFFING • POLISHING • DEBURRING • GRINDING

THE PACKER MACHINE COMPANY • MERIDEN, CONN.

services to include a hot tinning operation as a service to manufacturers of electrical equipment in the Middle West. In initiating this process the company purchased the equipment and business of the Hoosier Retinning Company of Camby, Indiana.

Lewis W. Lammiman

LEWIS W. LAMMIMAN, technical service manager with The DeVilbiss Co., Toledo, Ohio, recently returned from Europe after several weeks of assistance to and cooperation with users of DeVilbiss spray finishing equipment and exhaust systems in Italy, France, and England. He left on November 16 by Pan American Airways.

THE ELECTRIC PRODUCTS CO., Cleveland, Ohio, has appointed the Power Equipment Company as representative in the western counties of Iowa and Missouri, the panhandle counties of Texas, and the States of Arkansas, Oklahoma, and Kansas.

With offices in Kansas City, Missouri, the Power Equipment Company will handle all the industrial lines of The Electric Products Company.

WARD LEONARD ELECTRIC CO., Mount Vernon, N. Y., has announced the establishment of its Industrial Chrome Division, with William G. Dawson as manager. The division is engaged in the development and manufacture of chrome plating units, solutions, and processes for industrial hard chrome plating of machine tool accessories and component parts.

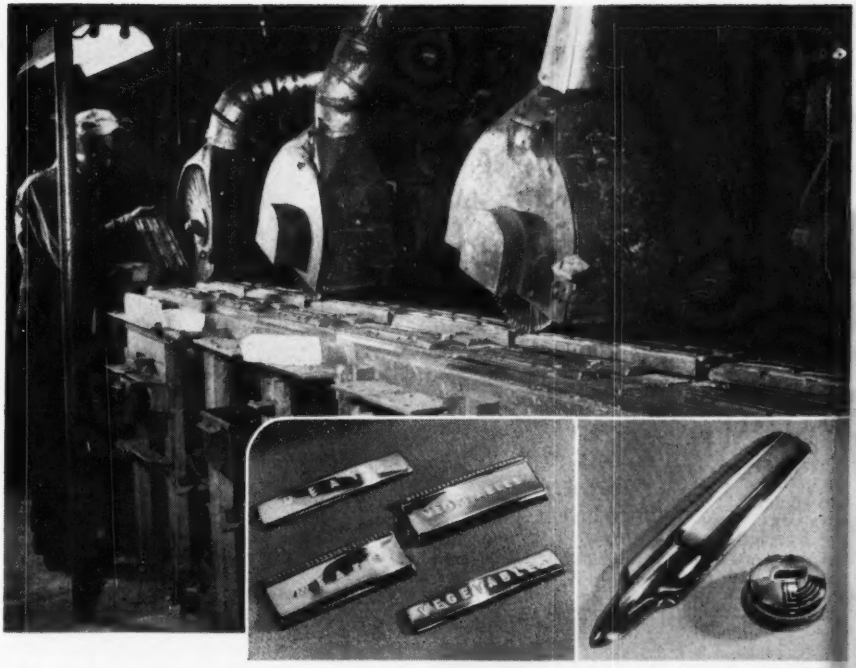
Exclusive license for the manufacture and sale of the chrome plating solution and plating unit used in the process was recently obtained by the company from Chromecraft Corp., Chicago, Illinois.

According to Melville Morris, president, **OPTIMUS EQUIPMENT CO.**, Matawan, N. J., has purchased the trademarks, patents, sales rights, and so on, of the **CIRCO PRODUCTS CORP.**, Cleveland, Ohio, manufacturer of metal parts cleaning and degreasing machinery. The Circo manufacturing operations will be moved to Matawan immediately, where the manufacture and sale of Circo equipment and degreasers will be carried on as the Circo Division of Optimus. The present Circo distribution setup will be continued and expanded.

Optimus Equipment Company is a subsidiary of Hanson-Van Winkle-Munning Company of Matawan, New Jersey, manufacturer of electroplating equipment and supplies.

Dr. Alton J. Ridings, president of the **PORTER-CABLE MACHINE CO.**, Syracuse, N. Y., has announced that his company has completed the purchase of the

Field service representatives from the Canadian, New England, New York, St. Louis, and Southern Division of **OAKITE PRODUCTS, INC.**, are shown gathered for the annual conference held recently at Hotel Statler New York City, to discuss technical-sales aspects of industrial cleaning and allied operations.



Applies sales appeal to stainless steel

...Automatically

RICH, lustrous finishes . . . the silent salesmen that highlight customer preference for your products . . . are now produced automatically, using Osborn Power Brushes.

Shown above are typical cut and color operations at the plant of a leading producer of polished and plated parts for the automotive and appliance industries. Trim parts formed from stainless steel are fed on an endless belt under rotating heads equipped with Osborn Buffbrushes* using abrasive compound. High finishes on these parts are mass produced with a minimum of handling . . . at a minimum of cost.

When you polish stainless steel, cold rolled steel or other metal parts, an **OBA** (**O**sborn **B**rushing **A**nalysis) may show you how to improve the quality of your work, increase your production and minimize rejects with power brushing. The services of the **O**sborn **B**rushing **A**nalyst for *all* finishing and cleaning problems are backed by Osborn's extensive technical facilities and are yours for the asking. Simply write *The Osborn Manufacturing Company, Department 381, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

*Trademark

LOOK FOR THE NAME OSBORN **RECOGNIZED EVERYWHERE FOR PROGRESS IN FINISHING METHODS**

JOHNSON ENGINEERING AND SALES CORPORATION of Rockford, Illinois.

The Johnson Corporation manufactures air-driven sanding machines used primarily in the furniture and automotive industries. These sanders will become a part of Porter-Cable's Speedmatic line of electric tools, which includes saws, abrasive belt sanders, routers, shapers, planes, and lock mortisers. The firm also manufactures a line of Guild homecraft tools, floor sanding machines, and industrial abrasive belt grinders.

All production facilities of the Johnson Corporation are being moved to Syracuse under the direction of Lloyd B. Benham, vice president and factory manager of Porter-Cable.

NEW POSITIONS

The Cambridge Wire Cloth Company, Cambridge, Maryland, has announced the appointment of the following new officers: executive vice president — **IRWIN F. PINK**; vice president and general manager — **EDWARD N. EVANS**; secretary and treasurer — **NINA E. PINK.**

Irwin F. Pink (left), Edward N. Evans

Mr. Pink joined the company in 1920. He was elected secretary and treasurer in 1938, vice president and general manager in 1942 and held the latter position until his recent appointment.

Mr. Evans joined The Cambridge Wire Cloth Company in 1937 following his graduation from Washington College where he received a degree of Bachelor of Arts. In 1940 he was made sales manager for the company's line of woven wire conveyor belts, industrial wire cloth, woven wire sling and special metal fabrications. Mr. Evans was made secretary and treasurer in 1942 and held this position until his recent appointment as vice president and general manager.

Miss Pink joined the company in 1930 and was made office manager in 1940. She became comptroller in 1944 and held that position until her recent appointment.

JOHN E. LOWE has been appointed western Michigan industrial representative of the Finishes Division of the Du Pont Company, with headquarters in Grand Rapids.

After receiving his B. S. degree in chemistry and business administration at Purdue University, Mr. Lowe joined Du Pont as a chemist at the Carney's Point, New Jersey laboratory, where he was stationed for three years. Since then he has had experience in technical, production, and sales departments.

In Grand Rapids Mr. Lowe succeeds **J. A. McVOY**, who was transferred to Chicago as industrial sales supervisor.

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NEW PROCESS FOR ALUMINUM FINISHING

- Pylumin® process provides remarkably adhesive base for paints and enamels; unusually high corrosion resistance for unpainted surfaces.
- Ordinary heated steel tanks are only equipment needed.
- No electric current required.
- Pylumin powder is ready mixed; proportioning errors impossible.
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- No dimensional changes.

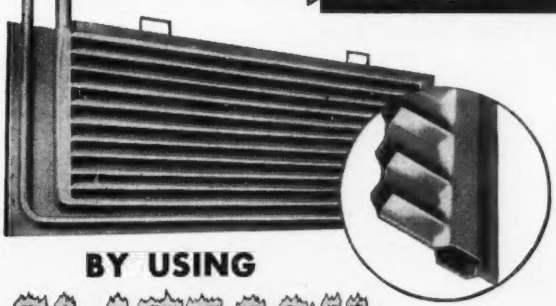
Write for literature.

PYRENE MANUFACTURING COMPANY

Metal Finishing Division

11 Empire Street, Newark 8, N.J.

YOU SAVE
- STEEL
- MANHOURS
- MONEY



BY USING PLATECOIL FOR TANK HEATING AND COOLING

YOU SAVE CRITICAL STEEL because "Platecoils" require less than ½ the steel used in pipe coils of the same surface area. A 22" x 119" Platecoil weighs 95 lbs. against 239 lbs. for an equivalent 2" pipe coil. 144 lbs. steel saved. YOU SAVE CRITICAL MANHOURS because "Platecoils" are easily installed, cleaned or replaced in minutes . . . No down-time . . . No tank dumping. Many manhours saved.
YOU SAVE MONEY because "Platecoils" cost up to 50% less in initial cost and require less maintenance. Investigate "Platecoils" today.

Send for complete technical manual and descriptive Bulletin No. P50

PLATECOIL
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KOLD-HOLD MFG. CO.
LANSING 4, MICHIGAN

TANK MAINTENANCE WITHOUT LOSS OF SOLUTION

There is no need for workmen to get inside the tank in order to make replacements or repairs. A Platecoil can be removed in a matter of minutes with the solution still in the tank.

LITERATURE

The new Platecoil Bulletin furnishes a complete description of the Platecoil method of tank heating. Write for your copy today.

HIGH BTU TRANSFER

More prime surface of Platecoil can be installed in a given area than can be obtained with pipe coil. Thus a more compact Platecoil unit provides much greater BTU transfer per unit area than can be obtained with pipe coil. Quick starts in heating tank solutions mean more hours of productive time.

Why Platecoils Cost Less

LOW FIRST COST

The initial cost of Platecoil is often 50% or more below the cost of equivalent pipe coil depending, of course, on the materials used in construction.

EASY INSTALLATION

By the use of "quick change hangers" Platecoil installations can be made in open tanks in one-half hour or less by one man and a helper.

NO THREADED JOINTS IN TANK

The entire Platecoil is electric welded and pressure tested. There are no joints to corrode or leak. Both connections to the Platecoil can be located above the liquid level where there is no danger of thread corroding and freezing.

GREATER TANK CAPACITY

A 22" x 47" Platecoil gives the same heat transfer surface as 32 feet of 1½" pipe. This pipe requires a space approximately 30" x 60". Platecoil thus saves about 50% over equivalent pipe coil.

WEIGHS 50% LESS

Weighing only about half as much as equivalent pipe coil, Platecoil is easy to handle. A whole maintenance crew is not needed to transport and install Pipecoil.

Kold-Hold Manufacturing Company, Lansing 4, Michigan

Arthur L. Perkins

Theodore F. Onkey, president of The Roberts Rouge Co., Stratford, Conn., announces the appointment of **ARTHUR L. PERKINS** as sales manager.

Mr. Perkins enjoys a wide acquaintance in the metal finishing industry, in which he has applied his practical knowledge, technical background, and production experience to the solution of finishing problems.

Mr. Perkins was formerly associated with the Minnesota Mining & Manufacturing Company, and Hammond Machinery Builders, Incorporated.

SOCIETIES

At the **ANNUAL MEETING** of the **INTERNATIONAL FELLOWSHIP CLUB**, held in Boston in June of 1950, President-elect George L. Nankervis appointed the following special committee to formulate plans and inaugurate methods for a closer association with the American Electroplaters' Society: A. P. Munning, D. X. Clarin, W. D. MacDermid, A. N. Braun, R. J. Hazucha, T. A. Trumbour, and Manson Glover as special secretary of this committee.

This committee formulated a questionnaire which was sent to all members of the International Fellowship Club. The large number of replies were reviewed and condensed, and a set of policies was submitted as recommendations to the executive officers of the A. E. S. The replies were practically unanimous in the opinion that they favored a definite restricted convention budget with reference to entertainment. Also, they were practically unanimous in the opinion that the registration fees shoud cover about 75 per cent of the convention budget.

In the immediate future the committee will submit a complete copy of its official report to the Supreme Society which will be available to all interested parties. The report will cover the complete set of recommendations adopted at this meeting.

The Executive Committee acted upon several other important matters, as fol-

SPRAY BOOTH MAINTENANCE

FOR

LOWER COSTS

AND

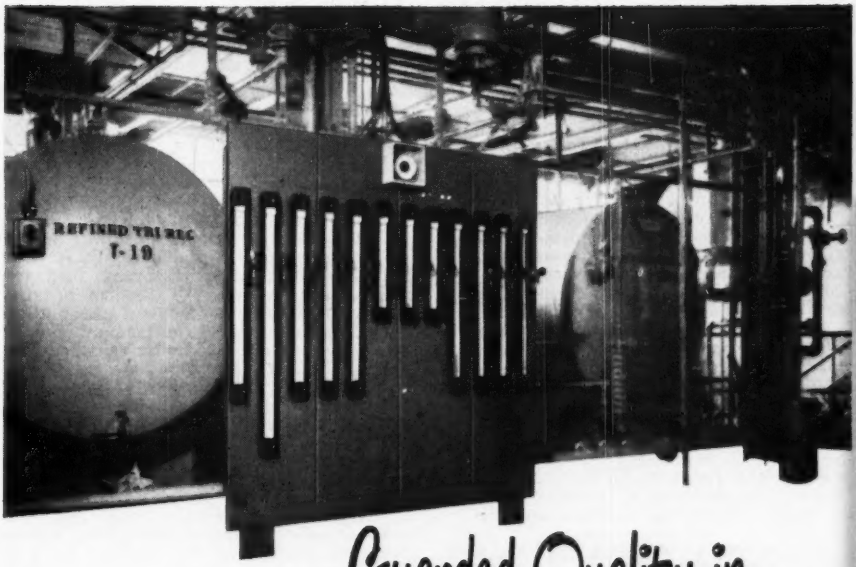
GREATER EFFICIENCY

Consult

CRESCENT CHEMICAL CORPORATION

Manufacturer of D-ZOLVZIT, *the leader in water wash materials and* E-KON-O-KOTE, *the new low priced-high quality booth masking product.*

PERTH AMBOY NEW JERSEY



Guarded Quality in
NIALK TRICHLORethylene

The most modern facilities in the industry are behind the production of NIALK* TRICHLORethylene.

So . . . for a metal-cleaning and degreasing agent of highest quality and stability, order from Niagara.

A PAMPHLET containing information on properties of NIALK TRICHLORethylene is available on request. Just send in coupon below.

*Trade-Mark

NIAGARA ALKALI COMPANY

60 East 42nd Street, New York 17, New York

EBG Liquid Chlorine*
NIALK Caustic Potash
NIALK Carbonate of Potash
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NIAGATHAL (Tetrachloro Phthalic Anhydride)*
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Niagara Alkali Company, Dept. H
60 East 42nd Street, New York 17, N. Y.

Gentlemen: Please send me a copy of your pamphlet on NIALK TRICHLORethylene.

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lows: (1) The secretary was instructed to proceed with the necessary papers for immediate incorporation of the International Fellowship Club; (2) The secretary was instructed to make arrangements for the necessary liability insurance covering any future social functions of the International Fellowship Club; (3) The Committee recommmended that the IFC seriously consider and act upon recommended methods of furnishing financial support to the Public Relations program of the A. E. S. In this matter, W. M. Phillips of the General Motors Corporation attended this special committee meeting and expressed his complete satisfaction and appreciation of the efforts that this committee proposed to instigate with reference to the subject of public relations.

Clyde Kelly, chairman of the 1952 Exhibition Committee, also attended the meeting and has advised that the Chicago Branch is proceeding with full plans for a successful exhibition to be held with the Chicago Convention in 1952.

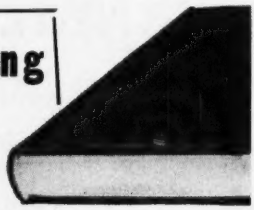
The Committee has also recommended to the A. E. S. Supreme Society that at subsequent conventions the IFC be allowed the afternoon of Monday, from one to three o'clock, for business sessions.

The **ANNUAL EDUCATIONAL SESSION AND BANQUET** of the **PHILADELPHIA BRANCH, A. E. S.**, was held at Hotel Broadwood, Philadelphia, on Saturday, November 18.

The first speaker was Dr. William Blum, National Bureau of Standards, whose topic was "The Effects of War on the Electroplating Industry." Dr. Blum stated at the outset that he was no prophet nor had he access to "inside" information, but that he was basing his remarks on the experience gained in previous situations. He surveyed the World War II role of the various metals used in plating: the use of nickel for engineering purposes as for electroforming tubing and similar parts; zinc plating on steel to replace parts made of brass, and for corrosion protection — the use of zinc plated pennies in 1943 saved five million pounds of copper; the extremely limited use of cadmium due to its scarcity; increased use of chromium for engineering requirements; gold and silver on radar parts and silver on steel tableware; scarcity of tin caused the increased use of electrolytic tin plate.

In commenting on the present crisis, Dr. Blum called attention to the constant depletion of our metals and the necessity of care being exercised in their use. We may expect increased stockpiling which removes metal from the market for any immediate use; inventory control orders

Bringing you Modern developments in plating processes and methods



HERE are the basic theories and principles of electroplating—the practical methods and processes that are of invaluable use to everyone concerned with electroplating and electrotyping. The most efficient methods of making electrodeposits on more than 40 different metals, alloys, and plastics are summarized completely in this thoroughly revised and enlarged book.

Principles of ELECTROPLATING & ELECTROFORMING

By William Blum, Chemist, U. S. Bureau of Standards and George B. Hogaboom, Consultant

Revised 3rd Edition
455 pages, 6 x 9
24 tables, illus.
$6.00

Completely revised to make it a more practical working guide, this book summarizes and digests the best of modern practice in the field. It covers qualitative, quantitative analyses of solutions; pickling, dipping; electropolishing; electroforming, electrotyping; producing phonograph record matrices, and manufacturing tubes, etc. Metals are dealt with in the same order as in the periodic system of elements.

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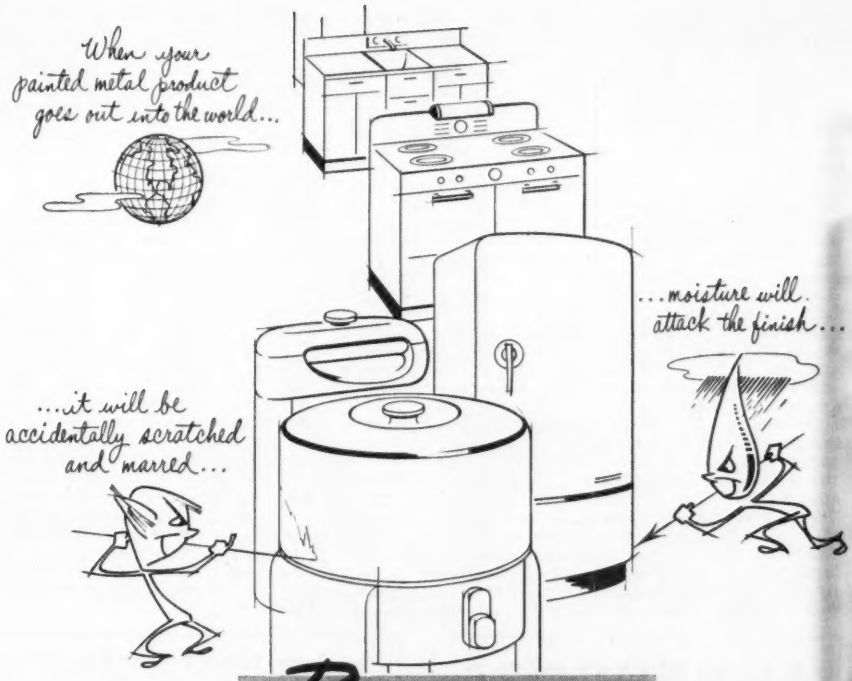
PRODUCTS FINISHING, 431 Main Street, Cincinnati 2, Ohio


When your painted metal product goes out into the world...
...it will be accidentally scratched and marred...
...moisture will attack the finish...

Better put BONDERITE under the paint to guard the finish and keep your product looking its best!

This is the corrosion resistant paint base that's doing a big job for manufacturers of painted metal products. On finished products from automobiles through the list to kitchen food mixers, Bonderite under the paint adds qualities that protect the paint finish, prolong fine appearance, promote customer satisfaction.
Bonderite is dependable, uniform, simple to control, adaptable. Its cost is low for the benefits it delivers.
Your product should have the protection of Bonderite.
Write for full information.

Bonderite, Parco, Parco Lubrite—Reg. U.S. Pat. Off.

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PARKER RUST PROOF COMPANY
2172 East Milwaukee Ave.
Detroit 11, Michigan

BONDERITE—Corrosion Resistant Paint Base • PARCO COMPOUND—Rust Resistant • PARCO LUBRITE—Wear Resistant for Friction Surfaces

limiting the amount of metals kept in stock to prevent hoarding; military priorities with the military agencies taking what they need through Defense Orders (D.O.); the civilian rationing of nickel to be probably followed by Government order rationing; aluminum and copper now rationed—cobalt also scarce and probably to be rationed.

As to what to do, Dr. Blum suggested (1) get Defense Orders; (2) conserve critical metals by plating less parts, less plated areas or, where possible, less plating thickness. As a warning note to the use of these alternatives, he said it would be a big mistake for the plating industry hastily to cut quality or thickness of plating. As to plating less, it may waste entirely the value of the plating applied. It is much better to encourage substitutions of materials than to produce an inferior plating job.

In closing, Dr. Blum stated that plating won't be shelved, nor will it be pampered—changes will be necessary to meet the changing conditions of the present emergency.

The next speaker was R. O. Hull of R. O. Hull & Company, who spoke on "New Ideas in Plating and Control." In line with the conservation of metals stressed by the previous speaker, Mr. Hull suggested: the use of a lower metal content cadmium solution—from 3 to 1.5 oz./gal.; the reduction of chromic acid in a chromium plating bath to 25 oz./gal. to save dragout; reduction of nickel sulfate to 25 oz./gal. in bright nickel solutions with, however, some sacrifice in plating speed; the addition of nickel sulfate to the solution when nickel anodes get short, and of zinc oxide to a zinc solution in the absence of zinc anodes.

Under the heading of "New Ideas" Mr. Hull mentioned new methods of stripping copper from steel, the use of Wood's high chloride nickel solution for striking instead of cyanide copper, the addition of small amounts (1 to 2 hundredths oz./gal.) of sodium hydrosulfite to improve the color of bright copper and minimize blistering, improvements in rinsing to prevent staining of brass, a new cadmium black for the Air Force, and an antifoaming agent to prevent explosions in zinc plating and cleaning solutions due to ignition by sparks of hydrogen entrapped in the foam. He described briefly and passed around plated specimens of a new bright Speculum deposit being developed by Battelle Memorial Institute, not yet released, which contains 40-50 per cent copper, balance tin. It is plated from an alkaline bath that utilizes tin in the stannous state. The deposit is hard and tarnish resistant.

BOOTHCOTE

cleans spray booths quickly, economically, safely!

Spray Boothcote on clean booth. Surplus paint can then be peeled off in sheets by any operator.

- Saves time and labor
- Time-tested; used for 11 years
- Mixed—ready to use

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Money back trial offers: 5 gals. $6.25 f.o.b. Buffalo or write for Circular.

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TAILOR-MADE BUFFING & POLISHING COMPOUNDS

for

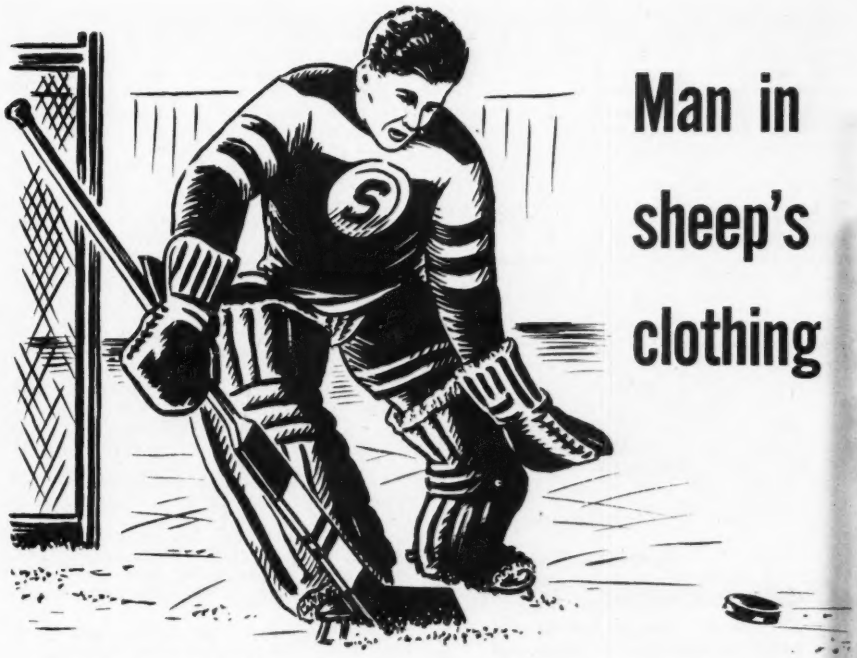
Aluminum, Brass, Copper, Stainless Steel, Carbon Steel, Etc.

EMERY CAKE, GREASE STICK

CEMENT AND THINNER for setting up wheels, belts, and rolls

HARRISON & COMPANY, INC.

Haverhill, Massachusetts



Man in sheep's clothing

On his tough job he can't do without custom-protection of special padding: light for extra speed and split-second saves, tough for sure defense against rushes through mid-ice. His especially-designed padding helps keep his team in the game.

The game of sales is tough too, but your product will move faster with the custom-protection of a Stanley finish. Every product application requires a different finish: when it's created to your exact specifications by Stanley chemists, your product will look better, sell better, and last longer.

Our emphasis at Stanley on "special finishes for special applications" has already helped manufacturers throughout industry to build sales. We'd like to help build yours. Write us about your finishing needs today: The Stanley Chemical Company, East Berlin, Connecticut.

STANLEY

Industrial Coatings

STANLEY CHEMICAL

LACQUERS SYNTHETICS JAPANS ENAMELS

The third speaker was Arthur W. Logozzo, Nutmeg Chrome Corporation and Past Supreme President A.E.S., who spoke on "Hard Chrome Problems." He showed slides illustrating the effect of the base metal structure on the deposit—the deposit reflects the basic structure—it does not change it. Data were presented on the cleaning and etching of various steels prior to hard chrome plating and it was stated that etching is essential to prepare properly uniform structures. With reference to stopping-off, Mr. Logozzo described the use of sheet lead shielding (0.004-inch thick sheet used widely) next to high points, with lacquer or plastic sheeting (Polyethylene) for stopping-off low points. This eliminates the buildup of corners. He recommended the use of light platings of tin or chromium to protect highly finished areas not being plated.

The following cycle for small tools was given:

1. Stress relieve (600 to 1200 deg. F.—check with metallurgist for proper temperature).
2. Anodic clean and rinse.
3. Acid dip—50 per cent HC1 with addition agent.
4. Thorough rinse.
5. Chrome plate—5 minutes average time for new tools. As little as 1½ minutes may be all that is required. Plated surface must be uniformly bright with no frosted areas.
6. Bake—350 deg. F.—1 to 3 hours (30 minutes at full temperature required).

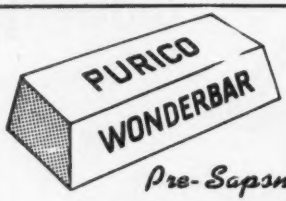
A general question period followed. The Educational Session concluded with a rising vote of thanks given to the speakers and to William Miller, engineer of Philadelphia Rust Proof Company, who generously donated his services in operating the slide and motion picture projectors.

The Banquet in the Crystal Ballroom started at 7:00 with 260 attending. An excellent turkey dinner was served.

THE 13th ANNUAL EDUCATIONAL SESSION, DINNER, AND DANCE sponsored by the **DETROIT BRANCH, AMERICAN ELECTROPLATERS' SOCIETY,** was held Saturday, December 2, 1950, in the Hotel Statler, Detroit.

The well-attended educational session, over which William J. Neill, A. E. S. president presided, featured the following subjects and speakers:

"Application of WES-X Copper and



Pre-Saponified

Composition

Cleans Better, Faster

Not just an ordinary buffing and polishing agent but a tested and highly effective composition that washes absolutely clean regardless of the type of work.

TRY WONDERBAR NOW! See how its quick action saves time and combats high labor cost.

Metal Cleaners — Plater's Supplies
Deodorants—Disinfectants

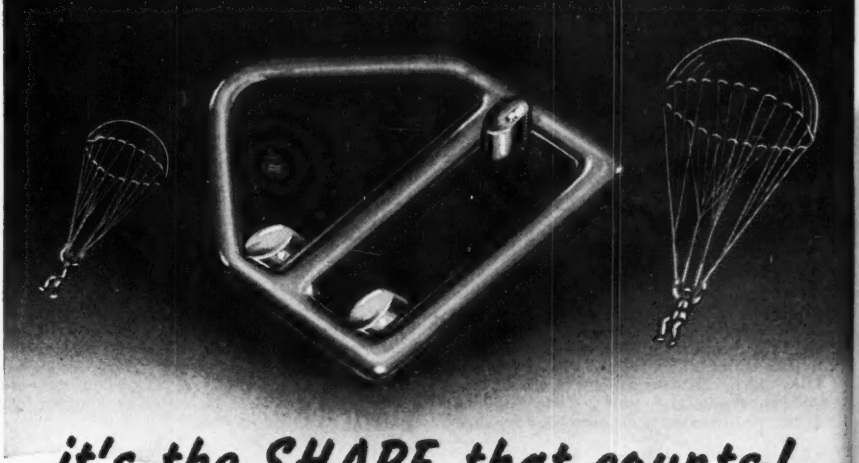
THE PURITAN MFG. CO.
WATERBURY, CONNECTICUT

YOUNG BROTHERS OVENS
for baking and drying

Designed and built to produce the finest results in baking processes such as PAINT FINISHING, METAL DECORATING, INSULATION BAKING. Batch or Conveyor Types for any fuel. Write for Bulletin 3.

—YOUNG BROTHERS CO.
1837 Columbus Rd. *Estab. 1896* Cleveland 13, O.

in BURNISHING MATERIALS



it's the SHAPE that counts!

PARACHUTE BUCKLES and other fittings of the airman's life preserver must have smoothly burnished corners and surfaces.

When your product design requires a burnishing material which reaches into hard-to-clean corners . . . use Abbott Burnishing Diagonals. They're shaped to do the job right.

Abbott Burnishing Shapes . . . Ball, Ovalball, Cone, Diagonal, Pin . . . are scientifically designed to make effective contact on any size and shape of stamping or casting. Each is made from Abbott bearing ball steel, deep hardened and polished to a mirror-like, glass hard finish. For *better* burnishing . . . use Abbott.

ABBOTT
the all round ball

WRITE for Abbott Catalog-Manual showing burnishing mixtures and suggestions.

THE ABBOTT BALL COMPANY
1064 New Britain Ave.
Hartford 10, Conn. U.S.A.

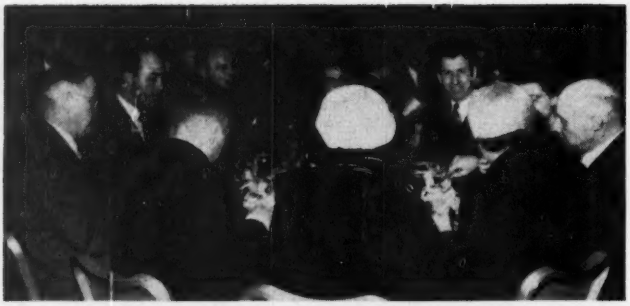


Fig. 1 — A.E.S. members seen at the Press Table at the Detroit Branch December 2 Annual Banquet are, at left, S. E. Sangster, Press and Publications Manager, and third from left, H. J. Struckhoff, Lasalco Inc., Vice Chairman, Finance Sub-Committee, and Chairman of the Finance and Publicity Sub-Committee.

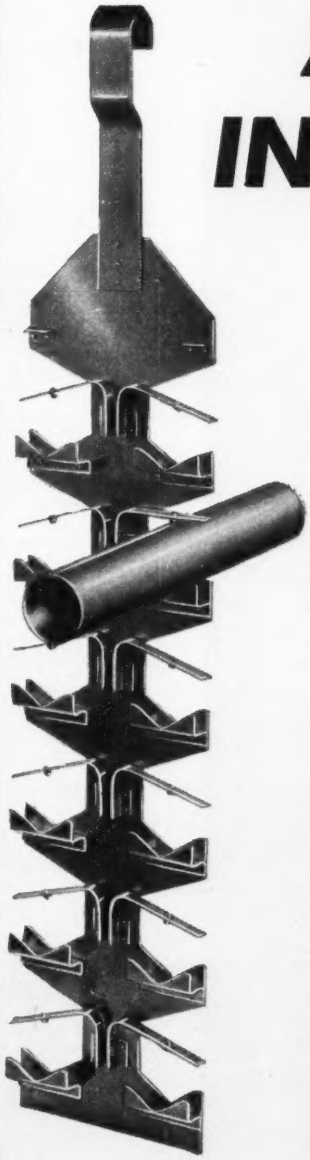
PR Plating," by Dr. G. W. Jernstedt, Manager, Electroplating Projects, Westinghouse Electric Corporation; "Sources of Our Strength," by R. E. Krafve, Office of Defense Products, Ford Motor Company; and "Distribution of Metallic Impurities in Nickel Deposits," Harlan V. Ogle, Graduate Student, Michigan State College, and Dr. D. T. Ewing, Professor of Chemistry, Michigan State College.

The banquet and party following the educational session was attended by more than 1600 members and guests. Dinner was served in several dining rooms, after which an entertainment program was presented simultaneously in two of the large ballrooms.

December Party Chairman C. E. Heussner, Chrysler Corporation, and Publicity Chairman E. A. Steegar, Harshaw Chemical Company, as well as all officers and members of the Detroit Branch are to be congratulated on this highly successful meeting.

Fig. 2—General view of banquet group in main ballroom with A.E.S. table in foreground. A.E.S. members seated at the table are (left to right) F. J. MacStoker, A.E.S. second vice president; Joseph J. Duffy, Jr., chairman, Annual Golf Tournament held at A.E.S. Conventions; Dr George P. Swift, A.E.S. third vice president; Clyde Kelly, general chairman 1952 Convention Committee; C. F. Nixon, A.E.S. first vice president; William J. Neill, A.E.S. president; Dr. William Blum, honorary member, Research Committee; Manson Glover, general chairman 1950 Boston Convention Committee.

(PRODUCTS FINISHING Staff Photos)



AIR DRY INSULATION

Anodizing Racks Fixtures

New air drying insulation for aluminum racks and fixtures used in anodizing will prevent destruction of costly racks and stop useless waste of current.

BUNATOL No. 796 is a high gloss black insulation of good body that can be applied by dipping, brushing or spraying. Formulated to resist acid solutions as used in anodizing operations. Excellent adhesion. Just a few coats provide a tough insulation that will resist abrasion and shop abuse. A low cost insulation operation which can be handled in any shop without use of an oven for baking.

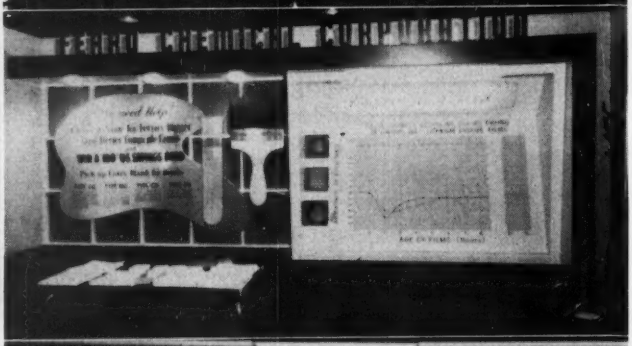
STOP OFF A new quick air drying lacquer for use on aluminum to stop off anodizing. Dries fast and holds the edge. Just peel off to remove. A time and labor saver for selective anodizing.

Just a note on your letterhead will bring complete information on these interesting new BUNATOL products.

Nelson J. Quinn Company

TOLEDO 7 • OHIO

Shown in these two photographs are graduates of the North Dakota Agricultural College, photographed in a convivial mood at the **FEDERATION OF PAINT AND VARNISH PRODUCTION CLUBS CONVENTION** held recently in Chicago.



A view of the Ferro Chemical Corporation booth at the **NATIONAL PAINT SHOW.**

The Shell Chemical Corporation booth at the recent **NATIONAL PAINT SHOW** in Chicago attracted the attention of quite a number of Convention visitors.

(Photos courtesy "Paint, Oil and Chemistry Review," Chicago 5, Ill.)

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Preformed Catalysts AND Catalytic Chemicals
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Supplies chemicals and apparatus for your laboratory.

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HARSHAW SCIENTIFIC DIVISION OF THE HARSHAW CHEMICAL CO. CLEVELAND 6, OHIO
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(Left) C. Homer Flynn, well-known sales executive and former sales manager of Plaskon Division, named executive secretary of the Federation of Paint and Varnish Production Clubs, replacing V. C. Bidlack who has resigned. (Center) Theodore F. Bradley, photographed as he delivered the Joseph J. Mattiello Memorial Lecture before the **ANNUAL CONVENTION OF THE FEDERATION OF PAINT AND VARNISH PRODUCTION CLUBS.** (Right) Dr. Alfred P. Haake who addressed the Convention on the subject, "Dilemma of Management." Dr. Haake discussed the many problems facing business management today, stressing the various Government regulations affecting private industry.

(Photos courtesy "Paint, Oil & Chemical Review," Chicago 5, Ill.)

TRAINING COURSES

Classes at the **DEVILBISS SCHOOL OF SPRAY PAINTING**, conducted by The DeVilbiss Co., Toledo, Ohio, will begin on the following dates: Industrial — January 8, February 5, March 5, April 2, May 7, and June 4; Contract Painters — January 22, February 19, and March 19; Auto Refinishing — January 29 and May 21; Automotive Distributor — February 26 and June 18.

There is no cost for the five-day instruction sessions; those attending must pay their own lodging and living expenses. Reservations should be made as far in advance as possible.

NECROLOGY

GUS J. SCHAFFNER, SR., died suddenly of a heart attack on December 1, 1950.

One of the founders of the Schaffner Manufacturing Co. Inc., Emsworth, Pittsburgh, Pa., Mr. Schaffner was vice president of the company at the time of his death.

Toku Matsumoto, center, representative of Japan's Paint Industry, speaks with Larry P. Killilea, right, at the Hercules Powder Company booth at the **PAINT SHOW.** *(Photo courtesy, "Paint, Oil and Chemistry Review," Chicago 5, Ill.)*

If the P&L finish on dentifrice tubes can take this punishment, why can't we make a finish for your product?

PRATT & LAMBERT-INC.
Industrial Finishes
NEW YORK BUFFALO CHICAGO
FORT ERIE, ONT.

J. F. ROCHE, chairman of the board of the Binks Manufacturing Company, died recently.

J. F. Roche

Mr. Roche's business life started in 1900 when he joined the staff of the Montana Power Company. In 1920 he went to Hotpoint in Chicago, as assistant to the president. His driving energy and sound ideas contributed much to the growth and prosperity of the company.

His next advance was to the Apex Electric Distributing Company as vice president. Here, Mr. Roche applied his broad knowledge of advertising and distribution with outstanding success.

Always alert to new opportunities, Mr. Roche accepted the position of executive vice president and membership on the board of directors of the Binks Manufacturing Company in January 1929. In addition to successfully piloting his company through the depression years, Mr. Roche served on the Advisory Board, National Emergency Council, for Illinois Division of N.R.A.; and devoted much time and energy to the National Association of Manufacturers, the Illinois Manufacturers Association, and other business and civic groups.

In 1936 Mr. Roche was elected president of Binks in appreciation of his outstanding work. Under his guidance the company's products improved and were standardized, and the manufacturing facilities were modernized and expanded. In April 1949 he accepted the chairmanship of the board of directors.

FOR SILVERSMITHS, PLATERS, JEWELRY MFGRS., ETC.

Supplied in brass, steel or nickel silver wire in sizes .0025 - .006 or bristle, Nylon or fibre.

Special sizes and shapes to order.

Write us (dep't. P) for catalog and price list.

DIXON & RIPPEL, INC KINGSTON, N. Y.
ESTABLISHED 1856

meetings

OF INTEREST TO FINISHERS

Jan. 15-18. Second Plant Maintenance Show and Conference, Auditorium, Cleveland, Ohio.

Jan. 27. Annual Educational Meeting and Party, Chicago Branch, American Electroplaters' Society, Stevens Hotel, Chicago, Illinois.

Mar. 5-9. Spring Meeting and Committee Week, American Society for Testing Materials, Cincinnati, Ohio.

Mar. 13-16. 1951 Conference and Exhibition, National Association of Corrosion Engineers, Statler Hotel, New York, New York.

Mar. 19-23. Seventh Western Metal Congress and Exposition, Civic Auditorium and Exposition Hall, Oakland, California.

Apr. 7. Annual Technical Session and Banquet, Boston Branch, American Electroplaters' Society, Hotel Statler, Boston, Massachusetts.

Apr. 25-26. Seventh Annual Meeting of the Metal Powder Association and Metal Powder Show, Hotel Cleveland, Cleveland, Ohio.

June 25-28. 38th Annual Convention, American Electroplaters' Society, Hotel Biltmore, Los Angeles, California.

You WILL BE IN GOOD COMPANY when YOU USE...

SURPHOS

Metal Phosphating Chemical

Currently Used On:

Sheet Steel, Machined and Cast Iron . . . Truck Hoods and Fenders . . . Auto Accessories . . . Tractors and Accessories . . . Clothes Washers . . . Stoves . . . Dish Washers . . . Hot Water Heaters Jackets . . . Air Conditioning Cabinets . . . Gas and Oil Space Heaters . . . Outboard Motors . . . Toys . . . Agriculture Implements . . . Lighting Fixtures . . . Diesel Locomotives . . . Many other items.

TO USE SURPHOS:

. . . dissolve in hot water to a concentration of one ounce per gallon and apply to metal by dipping or spraying in a power washing machine. Acid proof equipment not needed.

SURPHOS *Conditions Metal For Painting:*

- **CLEANS**
- **FORMS PHOSPHATE COATING**
- **PREVENTS RUSTING**
- **IMPROVES ADHESION of PAINT**
- **INCREASES HUMIDITY and SALT-SPRAY**
- **RESISTANCE OF PAINT**

INDUSTRIAL CHEMICAL PRODUCTS COMPANY

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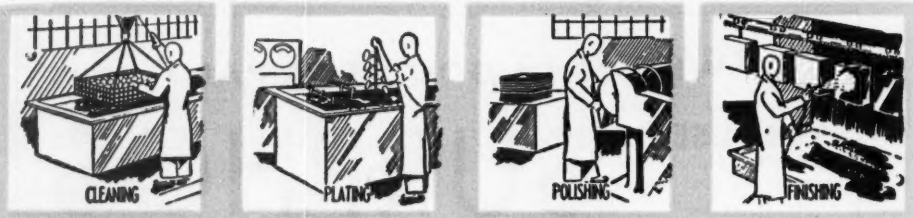
Representatives In Principal Cities

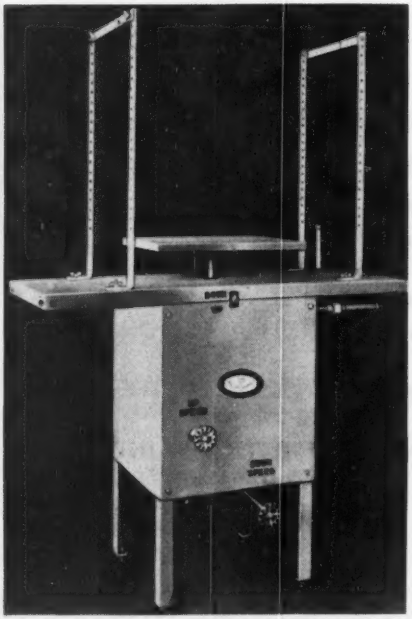
In Canada made and sold by Boyle Chemicals Ltd., Windsor, Ont.



New • EQUIPMENT • MATERIALS • PROCESSES

M&W Hydraulic Dipping Machine

A machine for dip coating small articles, such as earrings, bobby pins, simulated pearls, and so on, has been developed by the Maas & Waldstein Co., 438 Riverside Ave., Newark 4, New Jersey.



M&W Hydraulic Dipping Machine

In employing the Hydraulic Dipping Machine, a container of the finishing material is placed on a sturdy platform which is affixed to the top end of a hydraulic piston. The parts to be coated are suspended from vertical parallel bars over the container of the coating material, and the entire platform and coating material is raised at a given rate until the parts are completely immersed, at which time an automatic shutoff valve reverses the action and the container of material is withdrawn from the coated parts in a uniform vibrationless manner. In this manner striations and runs are practically eliminated on the coated pieces, the manufacturer states.

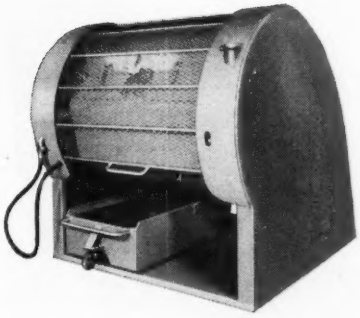
Both the upward and downward motion of the piston is entirely automotic, and the rate of speed at which the piston travels is adjustable.

The Hydraulic Dipping Machine is powered entirely by water pressure and is installed simply by connecting it to a water line. Eliminated are the conventional motor, gear, chain, sprocket, or pulley drive; hence, the elimination of waves and ripples that usually appear on the surface of the finish caused by mechanical vibration.

The parallel vertical arms may be adjusted to any desired height, and the hydraulic piston also is available in different lengths.

Gravi-i-Flo Tumbling Machine

A tumbling machine designed with an increased capacity for grinding, deburring, and finishing metal parts is being



Grav-i-Flo Tumbling Machine

offered by the Grav-i-Flo Corp., Dept. PF-12, 400 Norwood Ave., Sturgis, Mich. Employed in the Grav-i-Flo tumbling process, using Grav-i-Flo chips and compounds to produce smooth and high luster surfaces, the unit measures 5 feet 8 inches wide x 5 feet 8 inches deep x 5 feet 8 inches high.

Outstanding features contributing to the improved design of the Grav-i-Flo Tumbling Machine include: two 24 x 40-inchI. D. compartments which are furnished with ½-inch plate unlined or ¼-inch plate rubber-lined. Doors have cam locks with manually-released safety stops to provide pressure relief. The magnetic starter has a reduced voltage control to meet plant electrical standards. A lever is standard on the machine, but a push button switch is optional. A limit switch on the safety guard cuts off current to stop barrel rotation when the guard is lifted. The 220-440-volt 5 h. p. motor has a magnetic brake. Water and electrical services are integral with the machine and available for instant, convenient connections. The safety guard is counterbalanced for easy lifting.

Other equipment and materials available for the Grav-i-Flo tumbling process are Gravi-i-Flo Super-Brite finishing chips rated to cut 25 per cent faster on non-ferrous metals, and which eliminate such subsequent operations as ball burnishing; Grav-i-Flo compounds which change chip surface from finishing to cutting in minutes, thus eliminating need of transferring parts from the cylinder; Grav-i-Flo natural and synthetic deburring chips for all metal alloys; and motor-driven separator for removing chips from parts.

Phillips SolVoJet

Phillips Manufacturing Co., Dept. PF, 3475 Touhy Ave., Chicago 45, Ill., has designed its SolVoJet to provide safe, rapid, and thorough cleaning. Because the unit handles petroleum, emulsion, and light compound solutions as well as toxic and non-toxic solvents, any cleaning problems are solved quickly by recharging the unit with the proper solvent. The flexibility and ease of maneuvering the SolVoJet assure its varied usefulness, reduced material handling, and increased production.

Soil is removed by room temperature solvent action, and the pressure jet required to dislodge stubborn particles is supplied by a carefully selected rotary type pump equipped with mechanical seals. The pump is operated by a foot switch, and a conveniently located ad-

Phillips SolVoJet

justing valve permits quick regulation of the pressure. The operator is free to work with both hands, one directing the jet of solvent while the other manipulates unexposed surfaces. The cleaned parts are then drained or subjected to compressed air blowoff when complete removal of solvent is required.

The SolVoJet is 38 inches long by 24 inches wide x 36 inches high overall, and operates on single-phase 60-cycle, 110-volt power.

Electro Cupralum Anodes

Knapp Mills, Inc., Long Island City, N. Y., has adapted a homogeneous extrusion process, perfected by the company some time ago, to the production of a revolutionary type anode for the chromium plating industry.

The anode consists of a continuous full width copper core to which has been applied a homogeneous, chemically-bonded lead covering. According to the manufacturer, the anode has ten times the conductivity of customary lead anodes, and the distribution of current is uniform throughout the entire area.

Filterless Dust Collector Exhausts Cleaned Air to Out-of-Doors

Rated at 885 c. f. m. with 3-inch static suction, the "Dustkop" Model 8N50 dust collector illustrated herewith, product of Aget-Detroit Co., 207 Main St., Ann Arbor, Mich., is recommended especially where outside exhaust of cleaned air is required due to state regulations or to the presence of toxic fumes or vapors. The unit occupies a floor space of 20 x 30 inches and includes a self-clearing paddle wheel fan direct driven by a ¾ h. p. continuous duty motor which is said to be

"Dustkop" Model 8N50 Dust Collector

capable of handling dust originating from grinding, buffing, or polishing wheels up to 12 inches in diameter, as well as abrasive belts, and other equipment.

The dust-laden air enters the unit at the 5-inch diameter inlet. Dust, dirt, chips, and so on, are removed from the air in a cyclone separator and deposited in a compartment comprising the base of the unit. The cleaned air is exhausted to the outdoors through an outlet at the top of the cyclone.

Swartwout Airfuge

A complete line of separators for cleaning compressed air by means of centrifugal force has been announced by The

PAINT MIXER

MIRACLE
5 GALLON
PAINT REJUVENATOR
All paint restored to original consistency without opening the can.
2 minutes per gallon.
MIRACLE PAINT REJUVENATOR CO.
128 E. 10th St., St. Paul 1

SOLVENTS RECOVERED BY
THE LOFGREN PROCESS
We RECOVER YOUR
SOLVENTS and THINNERS
From - Wash Thinners, Spoiled Lacquers, Degreasing Machine Sludge, Etc.
Each customer's shipment, whether one drum or a carload, receives proper and separate treatment. Write to:
SOLVENTS RECOVERY SERVICE, INC.
101 Central Ave. Westfield, N. J.
or
HAMMOND SOLVENTS RECOVERY SERVICE
241 Brunswick St. Hammond, Ind.

Swartwout Airfuge

Swartwout Co., 18511 Euclid Ave., Cleveland 12, Ohio. Known as the Swartwout Airfuge, the separator is available in seven inlet and outlet tapping sizes, from ½ to 2½ inches.

According to the manufacturer, the Swartwout Airfuge removes 99 per cent or more of all impurities from compressed air without pressure drop. Moisture, oil, scale, and other solids in the air are whirled outward to the walls of the unit where they drain down to the trap section. At the same time clean, dry air passes unimpeded to feed line or tool, operating the equipment without danger of corrosion, wear, clogging, fire, explosion, or freezing which may occur with contaminated air.

A float-operated trap automatically releases accumulated liquids as they rise to a level above that necessary to effect a seal. Drain valve outlet is tapered to prevent stoppage by scale or other particles.

Bede Double Unit Paint Heater

The Bede Double Unit Paint Heater, designed to supply 24 to 28 gallons of hot paint per hour for installations using two or more spray guns, has been produced by Bede Products Inc., 4311 Ridge Rd., Cleveland 9, Ohio.

The unit consists essentially of two heating units mounted on a common base with a standard Bede circulating arrangement. The double unit heater heats paint to 160 to 200 deg. F. prior to application, and thereby reduces paint and solvent waste, increases the quality of the finish, and reduces rejects, the manufacturer states. Constant circulation of the paint is provided to minimize temperature drop in paint lines to the spray guns. Paint can be drawn directly from the original paint container, with the use of a pressure tank, the manufacturer states. The unit is completely explosion proof.

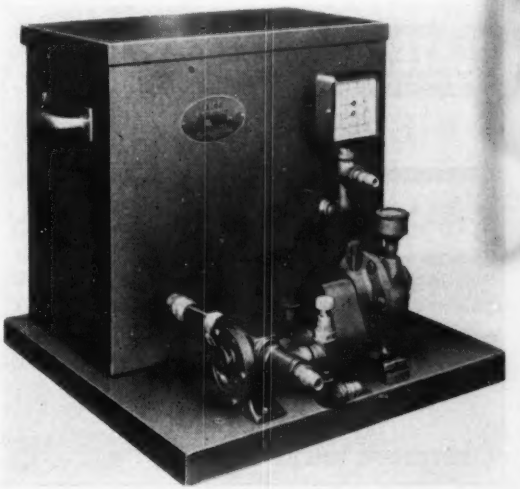
Used for spraying almost every type of finish, the Bede Double Unit Paint Heater provides coils for heating both paint and air. Paint coils are made of a special alloy steel which will not tarnish lacquers or delicate colors, it is claimed. The fluid pump used is specially designed for hot paint, and operates at slow speeds for longer life.

Paint temperature and pressure are said to be accurately controlled. The unit reaches operating temperature within 15 minutes. Longer capacity models or models for installations where a number of colors are sprayed at the same spray booth can be built to specifications.

Detrex 10

A multi-purpose cleaning chemical, identified as Detrex 10, is described in a new folder being distributed by the Detrex Corporation, Box 501, Detroit 32, Michigan.

This compound may be used as a medium-duty soak tank cleaner; electrolytic cleaner for ferrous metal parts; and as a water conditioner for all types of water-wash paint spray booths.



Bede Double Unit Paint Heater

Totrust Enamel

A double color system is what The Wilbur & Williams Co., Boston 15, Mass., has been able to produce in its 1951 color line of Totrust Enamel, a rust-inhibiting product. Not only does this now match almost 30 equipment manufacturers' original colors, but the colors are also applicable for identification of pipes and for the machinery safety code.

Available from the company upon request is its recently perfected color chip card, which uses actual paint instead of ink on the chips, therefore showing the paint gloss.

Model A-20 Chromaster and Chromasol

The normal life of most cutting tools and wear parts can be multiplied three to ten times by an industrial hard chrome plating process embodied in the Model A-20 Chromaster and Chromasol, product of Ward Leonard Electric Co., Industrial Chrome Div., 115 Mac Questen Parkway, S., Mount Vernon, New York.

The Model A-20 Chromaster is said to provide complete facilities for hard chrome plating metal surfaces up to 10 square inches at the recommended current density of 2 amps./sq. in. The unit is compact and completely portable. Powered by a dry disc, power pack, selenium rectifier, the Chromaster is complete with plating bath tank, heavy-duty rheostat, timer, ammeter, and reversing switch for stripping action. The hard chrome deposition can be controlled to tolerances of less than 0.0001 inch.

Model A-20 Chromaster

Operating at room temperature, Chromasol is a non-critical chrome plating solution shipped in a liquid, concentrated form. It delivers a hard chrome plate that follows the exact characteristics of the base metal to which it is applied, the manufacturer states. The rate of deposition is 0.002 inch per hour.

Using this process, 1½ minutes is the average time required to hard chrome cutting tools and wear parts and fortify them against chip-loading, galling actions, and heat wear. It is claimed that friction is thus reduced 12 to 20 per cent.

Johnson Air-Driven Sander

The Johnson Air-Driven Sander, formerly manufactured by the Johnson Engineering and Sales Corporation of Rockford, Illinois, is now available from Porter-Cable Machine Co., Syracuse 8, New York.

The sander, which is available in two models, is a two-pad opposed reciprocating unit used for fine finishing and rubbing. Since it is operated pneumat-

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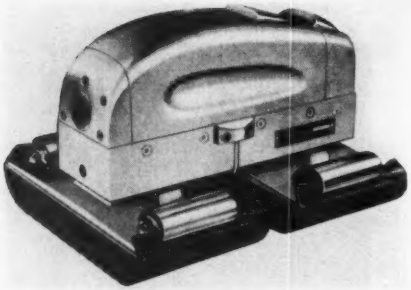

Johnson Air-Driven Sander

ically, it is claimed to assure complete safety when used in shops and plants where flammable coolants or fluids are used.

Protecto-Cote Aluminum Finish

Announcement has been made by the Chemclean Products Corp., 64 Sixth Ave., New York 13, N. Y., of a material for finishing aluminum, either as a base for paint or to protect the bare metal from corrosion.

Called Protecto-Cote, the material is provided ready-mixed and needs only to be dissolved in water, 6 ounces per gallon. The work is immersed in the solution at 185 deg. F., remaining in the bath about 5 minutes. No electric current is required. The equipment consists only of steel tanks with facilities for heating. The solution is "self-cleaning," making the process a one-operation job. Control is simple and easy, the manufacturer states.

Protecto-Cote may be used on machine parts as well as decorative consumer products, since no dimensional changes take place and close tolerances are not disturbed, it is claimed. As a base for paint, a high degree of adhesion is provided, together with excellent corrosion resistance.

Schrader Air Line Filter

A. Schrader's Son Division, Scovill Manufacturing Company, Inc., 470 Vanderbilt Ave., Brooklyn 17, N. Y., announces its Air Line Filter No. 3084 which

Schrader Air Line Filter No. 3084

features a filtering element composed of hundreds of laminations of a fine, newly developed material. The filtering area is large enough to assure full air flow even after long periods of use, it is said. Moisture that is trapped can be removed through a handy drain cock.

The filter is available in three standard pipe sizes: ¼, ⅜ and ½ inch. Pipe connections are the straight in-line type.

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PROCESSING TANKS
• Corrosion-proof construction of processing and storage tanks; industrial flooring.
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. . . in brazing, galvanizing, annealing, tempering or other high temperature installations. *Rod-Reinforced* construction means highest tensile strength, low thermal capacity, straight belt travel. Open mesh allows free heat circulation or drainage of process solutions.

Regardless of your specific process, there is a Cambridge woven wire conveyor belt to combine movement with processing of parts or materials.

Woven from any metal or alloy to the mesh or weave that best suits your operating conditions . . . heat, cold or corrosive agents . . . Cambridge belts are constructed to rigid specifications based on our experience in your industry. And any Cambridge belt can be equipped with special drive connections, retaining selvages, cleats, or other attachments for your particular process.

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When placed in the air line ahead of any air control mechanism or air operated tools, it protects them by removing rust, dirt and moisture from the line.

DeVilbiss Paint Cup Attachment

Easy operation and long service are features of the Model KR-550 One-Quart Paint Cup Attachment being presented by The DeVilbiss Co., Toledo, Ohio. On the suction feed cup attachment, the double cam lock and pressed steel yoke enable an operator to attach or detach the cup with minimum effort. The strong, heavy pressed steel yoke provides maximum strength to withstand abuse and extreme locking pressure. This yoke is mounted securely on the curved fluid tube — always in right position for quick assembly onto cup. The ingenious double cam locking device is simple and long-lasting with no fine threads to strip, wear or stick.

Less than one-third turn of the clamping lever locks and seals the cup securely to the lid. Likewise, if spilled material sticks cup to lid, the unlocking double cam will force it away and lift lid for easy removal. A special synthetic rubber gasket cemented into the groove of the cup lid always stays in place and will not deteriorate or affect spray material. Smooth, rounded, polished surfaces are easy to wipe clean. The seamless metal cup has no sharp corners or beading to collect paint, and there is a steel reinforcing ring on the bottom of the cup for best resistance to wear or dents.

DeVilbiss Paint Cup Attachment

DeVilbiss Air Dusting Gun

The DeVilbiss Co., Toledo, Ohio, is introducing its air dusting gun, a heavy-duty unit for blowing dust, dirt, and moisture off all types of equipment.

DeVilbiss Model DGB Air Dusting Gun

Fast acting, minimum weight, and easy handling are part of its modern, functional design, making it practical for all kinds of jobs. Any place where compressed air is available, the DGB Gun is claimed to prove indispensable through convenience and long service on countless jobs.

Among its outstanding features are the large, comfortable pistol grip, full length squeeze-type trigger, perfect balance and lightness, removable nozzle, concentrated air jet, convenient hanger hook, and an air valve that is removable for easy service.

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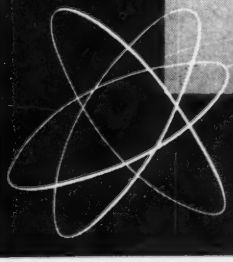
Ours is a self-sustaining solution, working from anodes. Gives excellent results in plating connectors, wave-guides and other electronic equipment where specified.

We make the anodes, too.



Baker & Co., Inc.

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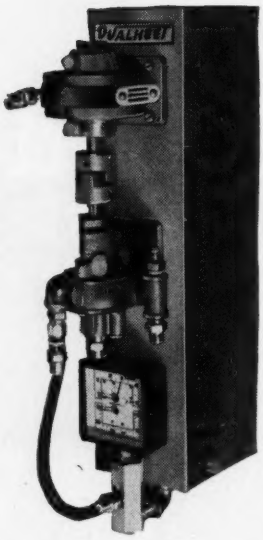
An extension model of the DGB Dusting Gun is also available for use in cleaning hard-to-reach spots and in general repair work.

Production Lacquer Heater

Beck Production Lacquer Heater for spraying lacquer at elevated temperatures, which is only 5 inches square and 19 inches long, has been marketed by Dualheet, Inc., Dept. H-48, 10118 Detroit Ave., Cleveland 2, Ohio.

The spraying of lacquers at elevated temperatures has a number of important advantages: (1) solids are proportionately higher and therefore mil-thickness obtained with each pass is greater; (2) solvent waste is lower, as much as 60 per cent; (3) increased coverage per gallon of finishing material; (4) fewer coats need be sprayed, usually one is enough; (5) finishing plant capacity can be materially increased; (6) finish has better flow-out, with less tendency to orange-peel and sag; (7) blushing can be entirely eliminated; (8) higher viscosity materials made possible by the hot-lacquer process can provide lacquer films with greater cold-check resistance, tensile strength and toughness—at no loss of solids.

The Beck Lacquer Heater is made of cast aluminum with an insulated aluminum jacket. Temperature control of material is accurately adjustable by a simple thermostat that takes its temperature directly from the material. Electrical components have been reduced to a minimum to permit long trouble-free service. The unit is equipped with both temperature and pressure gages that permit a constant check to be kept on the material.



Production Lacquer Heater

When used singly, the heater may be either mounted on the wall of the spray booth, or if desired, may be equipped with casters so that it may be readily moved from place to place. Outstanding feature is that several of the units may be grouped together in one case, so that several colors are available at proper temperature at all times.

Turco 1620 Process

The Turco 1620 Process, a development of Turco Products, Inc., 6135 S. Central Ave., Los Angeles 1, Calif., is said to simplify acid spray or immersion wash-

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Guaranteed 100% Pure Gold Content
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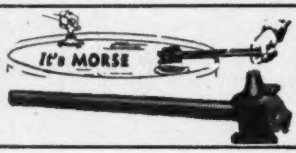
Instantly loosens, tightens 95% all plugs or bungs in steel drums. Has 16" extra-strong steel tubing handle. Wgt. only 2 lbs. Order 1 or more today!


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Nothing, practically *nothing*, can hurt that hard-wearing, one-coat baked finish! It's highly scuff-resistant, practically immune to soaps, alkalies, detergents, fats, grease and moisture. Sanitary and easy to clean, Vedoc is the perfect finish for a wide range of products. In white or pastels. Baking time: 20 minutes at 300° F. or 7 minutes with Infrared Drying. Write for samples and prices today. Your order—for gallon quantities or for carload lots—will receive our immediate attention.

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Vedoc

ing and surface conditioning of ferrous and non-ferrous metals prior to painting. Any existing spray washing setup of three or more stages ordinarily can be used without modification of established equipment or production lines.

Employing Turco 1620, an acid-type cleaner, the Turco 1620 Process performs three operations simultaneously: (1) removes soil and dirt without use of additives, often eliminating precleaning, (2) provides a firm paint bond, (3) inhibits rusting, usually eliminating the final chromic acid rinse.

PRODUCT LITERATURE

The publications listed in this section may be obtained free upon written request on company letterhead to the manufacturers concerned. Your courtesy in mentioning PRODUCTS FINISHING when requesting copies of these publications will be sincerely appreciated by the manufacturer and the publisher of this magazine.

Technical Data Bulletin 101, issued by the Lacquer & Chemical Corp., 214 40th St., Brooklyn 32, N. Y., discusses Alaka Electrical Insulating Enamels.

Dipping Baskets. Hanson-Van Winkle-Munning Co., Matawan, N. J., has available **Bulletin D-107,** which simplifies the proper selection of the right material for dipping baskets used in cleaning, plating, etching, bright dipping, and deoxidizing cycles. Also included are tables covering an extremely wide range of materials, meshes, and sizes of wire for standard baskets.

Reversing Switch. The Columbia Electric Mfg. Co., 4535 Hamilton Ave., N. E., Cleveland 14, Ohio, has prepared **Section 550** which describes and illustrates the Columbia Reversing Switch, designed to fill the need for a compact, low voltage, high current unit for use in electroplating.

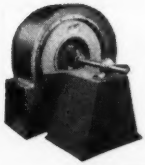
Singleton Plating Range Cells. Construction features and advantages, together with illustrations of the many plating range cells available from the company, are contained in **Bulletin CS-2,** obtainable from the Singleton Co., 10516 Western Ave., Cleveland 11, Ohio.

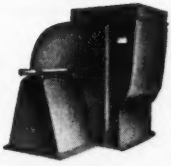
Ahcoloid Metal Cleaning Compounds for soak tanks, electrocleaning, power washers, and burnishing and barrel cleaning are the subject of an eight-page booklet available from Apothecaries Hall Co., Waterbury 20, Conn., A broad picture of methods and materials for the cleaning of various types of metal parts is presented.

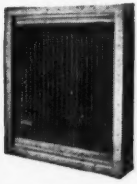
Specific recommendations for the application of various cleaning compounds are included.

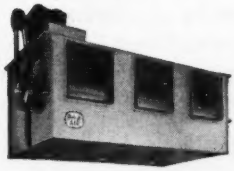
Bede Paint Heaters. An eight-page bulletin, obtainable from Bede Products Inc., 4311 Ridge Rd., Cleveland 9, Ohio, provides full information on the complete line of Bede Paint Heaters for all types of installations. Information about the Hot Spray Process, heating paint to elevated temperatures before spraying, is also given, together with its theory and practical application. Pictures of actual Hot Spray installations show typical uses of Bede units.

Electrical Instruments. Catalog No. 16, issued by the Simpson Electric Co., Dept. S, 5200 W. Kinzie St., Chicago 44, Ill., lists and describes the panel instruments supplied by the company, as well as the portable testing instruments designed for various purposes. Photographs of the various instruments together with dimensioned wiring diagrams are included in the catalog. A price list including all the various types of panel and switchboard as well as portable testing instruments is available.









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Industrial Finishes Sales Manager for Greater Chicago

Midwest manufacturer of complete and quality line of industrial finishes is desirous of employing an experienced sales manager for Chicago and environs. He must be a man of experience, character, and not afraid of work. Address confidentially. Box No. 12, c/o Products Finishing. 431 Main St., Cincinnati 2, Ohio.

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1—Detrex No. 325 conveyorized return-type Degreaser. Complete with pumps and motors. Good condition.

1—6 ft. Binks, water-type, exhaust spray booth complete with pumps and motors. Set up for Electro-static spraying. Good condition.

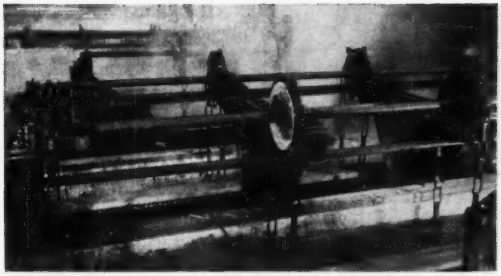
THE BREARLEY COMPANY

Rockford, Illinois

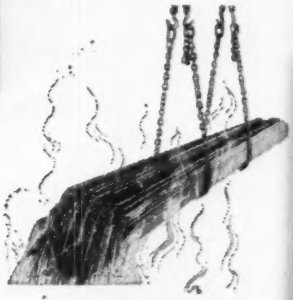
Packaged Spray Booths. Kellogg Div., American Brake Shoe Co., 93 Humboldt St., Rochester 9, N. Y., has available a four-page bulletin which describes and illustrates its Packaged Automotive Spray Booths. Complete specifications are given.

Divine Compress Canvas Contact Wheels. Divine Brothers Co., Utica 1, N. Y., has prepared a folder descriptive of these wheels for use in polishing with abrasive belts. Features and operating data are provided, together with illustrations.

Gardner Variable Impact Tester, an instrument designed to determine impact resistance of various types of coatings, is discussed in a leaflet announced by Henry A. Gardner Laboratory, Inc., Bethesda 14, Maryland.



Former chains on these mechanical picklers used to fail in 2½ months. Monel chains are giving 1½ years' service 24 hours a day in hot, 10% sulfuric acid. Average load is 5 tons. Reduced shut-downs have increased output substantially.



Monel sling chains handling 4 to 5 tons of steel tubing. 75 such chains are in this plant. Where 1¼" chains of another metal failed in 9 months, these Monel chains have already served 6 years.

The Life is longer
The Weight is less
The Metal is Monel

Monel® Pickling Chain—like *any* piece of Monel pickling equipment—pays for itself.

Any pickling-room foreman or superintendent who has used Monel will tell you that.

For he knows that Monel's superior resistance to corrosion by hot pickling acids and fumes means longer life and greater safety.

He knows, too, that the higher strength of Monel makes it possible to use *lighter* chain that saves up to 20% in dead weight.

Monel link chain is formed from hot-rolled rod, and welded. The welds retain all the strength and all the corrosion resistance of the parent metal.

Regular Monel chain ranges in size from ¼" to 1¼". In addition, special types of sprocket chain, as well as a complete line of accessories such as hooks, lifting links, U-bolts and open links are available.

Whether you are using chain as slings or in mechanical picklers, you'll get the maximum in safety, long life and light weight, if you make that chain *Monel!*

Mechanical pickler chains made of Monel for use in the pickling of steel pipe prior to galvanizing. Chains are so designed to permit quick and easy replacement of any individual part.

Although Nickel and Nickel Alloys are currently in short supply we will continue to bring you news of products, applications, and technical developments.

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extra life
extra capacity
extra safety

The Finishing Touch — **By J. A. Patterson**

"Just let me know if he bothers you!!!"

The No. 41 LIFTING HOOK

. . is primarily designed for drums, although it may be used for barrels. The hook consists of double steel rods and a malleable steel hook with 3 inch diameter welded ring. Lifting capacity is 1000 lbs.

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"ROCK-A-DRUM" VERTICAL TRUCK

WHEELS TO ANY LOCATION!

Specially engineered for use with drums which can be drained only in a vertical position. The Morse Truck is easily locked into dispensing position by one man. The weight of the load is evenly distributed over the four wheels and adequate clearance is provided under pouring spout.

Write for Bulletin 949

Model #44

MORSE MANUFACTURING CO., INC.

125 Dickerson Street Syracuse 2, N. Y.

Tank Rheostats. Columbia Cast Grid Type Tank Rheostats for electroplating control, with capacities from 15 to 5000 amperes, are described and illustrated in a four-page bulletin, **Section 500,** issued by the Columbia Electric Mfg. Co., 4535 Hamilton Ave., N. E., Cleveland 14, Ohio.

Coment Projection Heater, product of The New York Blower Co., 3166 S. Shields Ave., Chicago 16, Ill., and designed for efficient heating from high-ceiling areas, for use over crane rails, tall machinery and similar equipment, and for door heaters over small openings, is fully described and illustrated in **Bulletin 484.**

Simpson Model 381 Capacity Bridge. A data sheet has been prepared by the Simpson Electric Co., 5200 W. Kinzie St., Chicago 44, Ill., which describes and illustrates its unit for making capacity measurement with ease and assurance.

"The Real Secret of Better Plating" is the title of a ten-page pamphlet prepared by Joseph B. Kushner, director of the Joseph B. Kushner Electroplating School, 115 Broad St., Stroudsburg, Pa., and is available to those requesting it on company letterhead and mentioning their position.

Catalogs

FOR YOUR LIBRARY

To obtain copies of the catalogs listed here, indicate on the coupon the number of the item in which you are interested and mail as directed.

1. Polishing Wheel Cement

"Setting Up Polishing Wheels" is the title of a brochure prepared by Industrial Lubricants Co. Inc., Detroit, Mich., containing many tips on setting up polishing wheels with Grainlock polishing wheel cement for long life and maximum efficiency.

2. Precious Metal Plating

A 20-page booklet issued by A. Robinson & Son, New York 2, N. Y., presents in usable form accepted methods applied in the electroplating of such articles as watch cases, insignia, jewelry, novelties, pen and pencil parts.

3. Brush Electroplating

Equipment and supplies needed for operation of electroplating by the brush method are listed and described in Bulletin 148 distributed by the Ajax-Consolidated Co., Chicago 50, Illinois.

4. Dust Collectors

Catalog No. 34, published by the Torit Mfg. Co., St. Paul, Minn., outlines methods for collecting and cleaning dust-laden air from around industrial machines and includes complete information on the Torit line of self-contained and cyclone type dust collectors.

5. Appli-Matic Bulletin

A bulletin describing the operation of Vander Wal-Wagner Appli-matics, mechanical buffing compound applicators, is available from Wagner Bros., Inc., Midland, Detroit 3, Mich. Use of the Appli-matics in manual and automatic polishing and buffing setups, as well as advantages of the units, is detailed in the bulletin.

6. Strippable Plastic

Technical Data Bulletin No. T504, describing Copeel Strippable Plastic Coating, is being issued by the Maas & Waldstein Co., Newark 4, New Jersey.

7. Perflow Nickel Process

A booklet issued by The Harshaw Chemical Co., Cleveland 6, Ohio, outlines operating instructions and equipment requirements for users of the Harshaw Perflow Plating Process, and includes outlines of methods used in solution control.

8. Finishing Equipment

The Despatch Oven Co., Minneapolis 14, Minn., has available Bulletin 51-C descriptive of its finishing systems.

9. Metal Cleaners

Ahcoloid Metal Cleaning Compounds for soak tanks, electrocleaning, power washers, and burnishing and barrel cleaning are the subject of an eight-page booklet available from Apothecaries Hall Co., Waterbury 20, Connecticut.

10. Conveyor Belts

A complete, basic reference on conveyor belts, designs, systems, and metallurgy is being offered by the Cambridge Wire Cloth Co., Cambridge, Maryland.

11. Flock Color Card

A color card illustrating 20 stock shades of flock in rayon, cotton, and wool can be obtained from the Claremont Waste Mfg. Co., Claremont, New Hampshire.

12. Portable Spray Unit

Complete information on the Binks DP ½ h.p. Portable Spray Unit, either electrically powered or gasoline engine driven, is contained in Bulletin 601, available from the Binks Mfg. Co., Chicago 12, Illinois.

13. Rotary Automatic Polishing Machines

Hammond Machinery Builders, Inc., Kalamazoo, Mich., has released its Catalog No. 50 describing its Super Model K-46-6 Indexing Rotary Automatic Finishing Machines. Also described are the smaller J Series indexing and continuous Rotaries, Strait-line Automatics, and various types of abrasive belt and wheel type heads.

14. Cleaning Machinery

An illustrated folder descriptive of its complete line of machinery for washing, rinsing, and drying metal parts is now being offered by the Cincinnati Cleaning and Finishing Machinery Co., Ironton, Ohio.

15. Abrasive Belts

Thirteen production reports from various manufacturers citing advantages of Resinall Metalite Belts are contained in a folder issued by Behr-Manning, Troy, New York.

16. Vapor Degreasing

"Vapor Degreasing with Du Pont Non-Flammable Solvents" is a title of a book on practical metal cleaning being issued by E. I. du Pont de Nemours & Co., Inc., Electrochemicals Dept., Wilmington 98, Delaware. Information included in the book concerns the application of vapor degreasing to metal cleaning problems. The book is illustrated with application photographs showing vapor degreasing in various industries.

17. Phosphate Coating

The Neilson Chemical Co., Detroit 7, Mich., has issued Prep-N-Cote Bulletin 48-91, describing the application of Prep-N-Cote to the preparation of steel and aluminum for painting.

18. Paint Film Value

"3/1000 of an Inch," the title of an eight-page booklet depicting the devastation wrought by the lack of painting and ways to combat it, can be obtained from the National Paint, Varnish and Lacquer Association, Washington, D. C.

19. Abrasive Grains

The Exolon Co., Tonawanda, N. Y., has issued a folder describing Exolon abrasive grains and polishing procedures applicable to various industry groups.

20. Nickel Plating

"Practical Nickel Plating" is the title of a comprehensive booklet issued by the International Nickel Co., New York 5, N. Y., which contains a summary of information on industrial nickel plating, including solution compositions, operating conditions, process cycles, cause and correction of plating difficulties, and solution purification methods.

21. Organic Finishing

A 12-page technical bulletin outlining basic points to be considered in the planning of a complete organic finishing system has been prepared by Peters-Dalton, Inc., Detroit 12, Michigan.

22. Cleaners and Paint Strippers

Six technical bulletins describing paint strippers, cleaners, and phosphate coating materials are being distributed by Pelron Corp., Lyons, Illinois.

23. Reversing Switch

Columbia Electric Mfg. Co., Cleveland 14, Ohio, has prepared Section 550 which describes and illustrates the Columbia Reversing Switch, a compact, low voltage, high current unit for use in electroplating.

24. Clear Lacquer

Stanley No. 45X-70 Clear Gloss Synthetic, a water-white coating for silver, or brass, chromium, steel, iron, magnesium, and zinc, is described in a data sheet available from The Stanley Chemical Co., East Berlin, Connecticut.

25. Abrasive Belt Head

Bulletin No. 17 issued by The Packer Machine Co., Meriden, Conn., describes Model No. 18 universal abrasive belt head and contains suggested applications of the device.

26. Tumbling

"Precision Tumbling with Alundum Abrasives" is the title of a booklet of interest to finishers of metal or plastic parts, which is being offered by the Norton Co., Worcester 6, Massachusetts.

27. Degreasing Solvent

Niagara Alkali Co., New York 17, N. Y., has released a six-page folder describing its Nialk Trichlorethylene for rapid, thorough cleaning of all types of metal parts.

28. Baking and Drying Ovens

Both batch and conveyor type baking and drying ovens are the subject of Bulletin 5 issued by the Young Brothers Co., Cleveland, Ohio.

29. Finishing Equipment

J. Holland & Sons, Inc., Brooklyn, N. Y., has published Folder "M" describing finishing equipment furnished by the company.

30. Burnishing Materials

The Abbott Ball Co., Hartford 10, Conn., has prepared data and charts illustrating and describing its line of burnishing materials.

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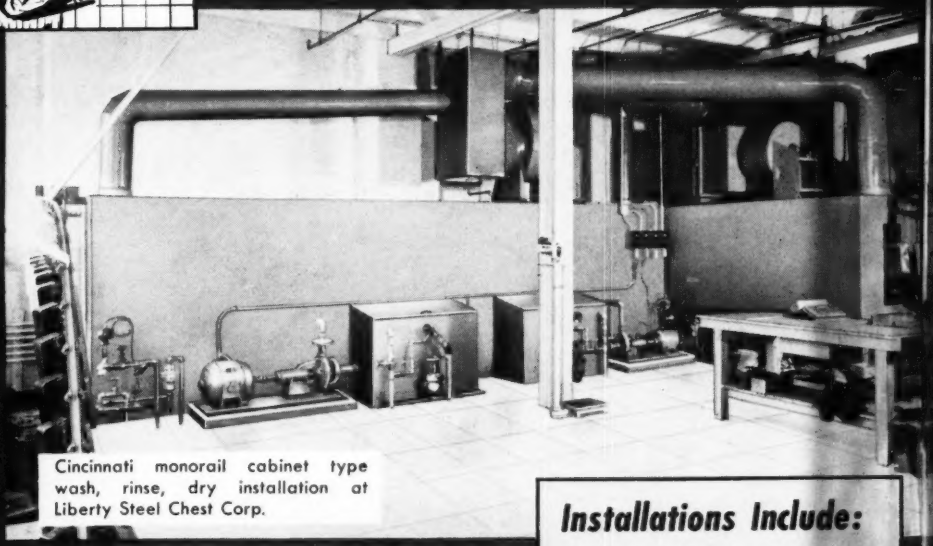

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